

## Repair Manual

A1 2018 ➤ , Q3 2012 ➤ , A8 2018 ➤ ,  
A3 2004 ➤ , A8 2003 ➤ , TT 2015 ➤ ,  
A3 2021 ➤ , Q7/ Q8 2007 ➤ ,  
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A4 2008 ➤ , Q4 e-tron 2022 ➤ ,  
A6 e-tron 2025 ➤ , Q2 2019 ➤ ,  
A6 2019 ➤ , e-tron GT 2022 ➤ ,  
A8 2010 ➤ , Q2 2016 ➤ , Q5 2017 ➤ ,  
R8 2015 ➤ , Q5 2008 ➤ , A3 2013 ➤ ,  
R8 2007 ➤ , A4 2015 ➤ , A5 2025 ➤ ,  
TT 2007 ➤ , A1 2011 ➤ , A5 2008 ➤ ,  
A6 2005 ➤ , Q6 e-tron 2024 ➤ ,  
A5 2016 ➤ , A6 2011 ➤

### Body - General Information

Edition 08.2024

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## List of Workshop Manual Repair Groups

### Repair Group

52 - Body, General Information



# Audi

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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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## 52 – Body, General Information

### 1 Safety Precautions and Repair Information

(Edition 08.2024)

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⇒ [“1.1 Safety Precautions”, page 1](#)

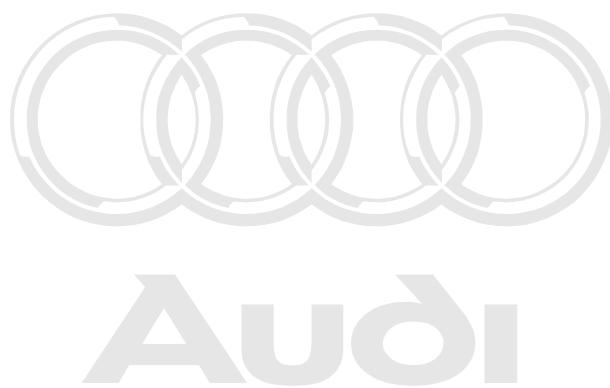
⇒ [“1.2 Repair Information”, page 1](#)

#### 1.1 Safety Precautions

Note the safety precautions. Refer to ⇒ Safety Precautions and Repair Information; Rep. Gr. 00 ; Safety Precautions .

#### 1.2 Repair Information

Pay attention to the repair information. Refer to ⇒ Safety Precautions and Repair Information; Rep. Gr. 00 ; Repair Information .



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## 2 Body Repairs, Basics

- ⇒ “2.1 Body Repairs, General Information”, page 2
- ⇒ “2.2 Original Joint”, page 2
- ⇒ “2.3 New Parts”, page 2
- ⇒ “2.4 Separating Cuts”, page 3
- ⇒ “2.5 Body Sub-Parts and Partial Sections”, page 3
- ⇒ “2.6 Remaining Material, Removing”, page 3
- ⇒ “2.7 Replacement Joining Procedures in Repair, Steel”, page 3
- ⇒ “2.8 Replacement Joining Procedures in Repair, Aluminum”, page 3

### 2.1 Body Repairs, General Information

The respective vehicle-specific repair manual describes standard repairs. Further descriptions are not given because if there are more extensive repairs, the damaged area should be removed at the original joint. Where this is possible, the joining techniques can be implemented according to a comparison.

- ◆ Refer to ⇒ Rep. Gr. 52 ; Replacement Joining Procedures, Steel .
- ◆ Refer to ⇒ Rep. Gr. 52 ; Replacement Joining Procedures, Aluminum .

All repairs with special separating cuts and joining techniques that do not correspond to the original joint (production status) are checked and approved by the technical development team by evaluating, strength testing and crash testing.

### 2.2 Original Joint

The original joint refers to connections that were created while vehicle manufacturing.

These connections should be reconstructed when performing body repairs.

When doing so, ensure that the production number of weld points does not fall short when making repairs.

Methods and procedures differing from the original joint are described in the applicable vehicle-specific, body repair manual.

### 2.3 New Parts

New parts that are no longer accessible from the interior after the repair, for example the side sill, should have corrosion protection installed on them before welding for corrosion protection reasons. It is advisable to cover the welding flanges when doing so.

Additional information can be found in the paint manual. Refer to ⇒ Paint General Information; Rep. Gr. 00 ; General Information; Corrosion Protection for Body, Attached and Welded Parts .

Check new parts, such as doors, panels or fenders, for transport damage before sending to the paint shop. This prevents additional painting, if transport or accident damage to the vehicle is noticed during installation.

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## 2.4 Separating Cuts

Separating cuts that influence the strength of the body and the operational safety and traffic safety of the vehicle must be carried out according to the specifications of the vehicle-specific body repair manual.

## 2.5 Body Sub-Parts and Partial Sections

Sub-parts are sections of individual parts (for example, front and rear end points) that are delivered pre-cut.

In contrast to this, partial sections are to be cut out from replacement parts. In individual cases, work is to be performed according to the methods described and represented in the vehicle-specific repair manual.

Usage of sub-parts or partial sections, as well as using special equipment may influence repair times.

## 2.6 Remaining Material, Removing

If body parts are cut out roughly, based on separation cuts described in the vehicle-specific body repair manual, then most of the spot-welded bonded joints can be drilled out, using the spot weld breaker.

## 2.7 Replacement Joining Procedures in Repair, Steel

Production	Repair
◆ Spot welds	<ul style="list-style-type: none"> <li>◆ Spot-welded bonded joint / MAG</li> </ul> <small>Copyright by AUDI AG. AUDI AG does not guarantee or accept any liability for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability for the correctness of information in this document. Copyright by AUDI AG.</small> <ul style="list-style-type: none"> <li>◆ Plug welding / MAG</li> <li>◆ MAG Welding</li> </ul>
◆ MAG Welding	◆ MAG Welding
◆ MIG Soldering	◆ MAG Welding
◆ Laser Welds	◆ MAG Welding
◆ Laser Soldering	<ul style="list-style-type: none"> <li>◆ MIG Soldering</li> <li>◆ Bonding</li> <li>◆ MAG Welding</li> </ul>
◆ Bonding	<ul style="list-style-type: none"> <li>◆ Bonding</li> <li>◆ MAG Welding</li> </ul>
◆ Spot weld bonding	<ul style="list-style-type: none"> <li>◆ Bonding with spots</li> <li>◆ Additional welding points</li> <li>◆ Additional MAG weldings</li> </ul>
◆ Pop Rivet	◆ Pop rivet (only use specified pop rivets)

## 2.8 Replacement Joining Procedures in Repair, Aluminum

Production	Repair

◆ MIG welding	◆ MIG welding
◆ Laser Welds	◆ Bonding ◆ Rivets
◆ Bonding	◆ Bonding ◆ Rivets
◆ Punch rivets	◆ Punch rivets
◆ Pop Rivet	◆ Pop rivet (only use specified pop rivets)



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### 3 Explanation of Symbols

⇒ “3.1 Symbols for Separating Components”, page 5

⇒ “3.2 Symbols for Welding and Soldering”, page 5

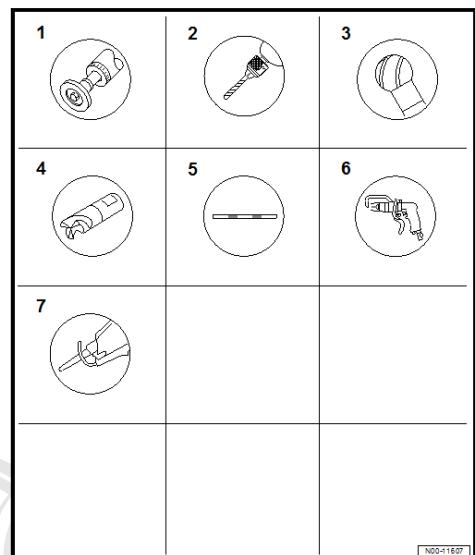
⇒ “3.3 Rivet, Symbols”, page 6

⇒ “3.4 Preparation, Symbols”, page 6

⇒ “3.5 Corrosion Protection, Symbols”, page 6

#### 3.1 Symbols for Separating Components

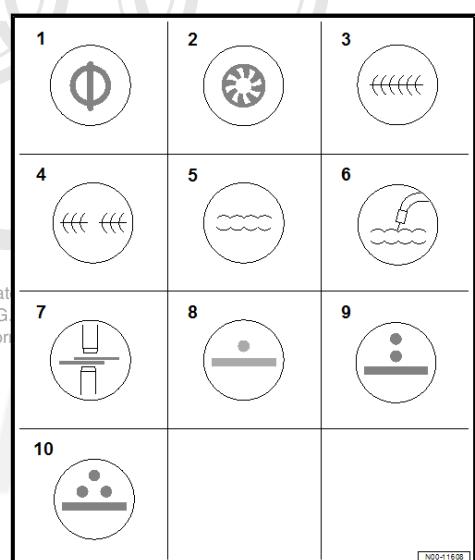
- 1 - Grinding / grinding down to bare surface
- 2 - Drilling
- 3 - Ball nose end mill
- 4 - BTR mill
- 5 - Separation Cut
- 6 - Loosening weld spots
- 7 - Sawing



#### 3.2 Symbols for Welding and Soldering

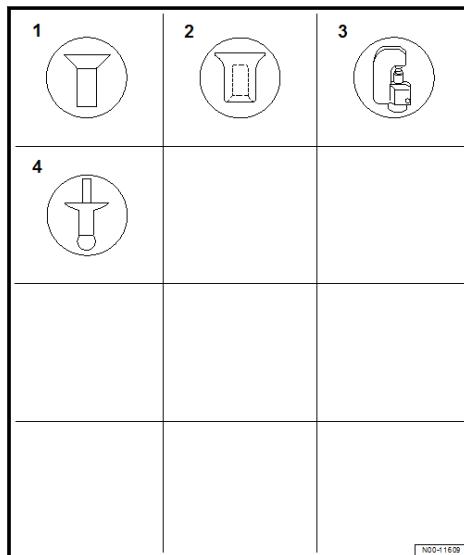
- 1 - Stitch weld seam
- 2 - Gas-shielded arc plug weld
- 3 - Gas-shielded arc continuous weld seam
- 4 - Gas-shielded arc continuous weld seam (staggered)
- 5 - Brazing
- 6 - MIG brazing
- 7 - Resistance spot welding (straight-line spot weld), general information
- 8 - Straight-line spot weld (single row)
- 9 - Straight-line spot weld (double row)
- 10 - Straight-line spot weld (double row, staggered)

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### 3.3 Rivet, Symbols

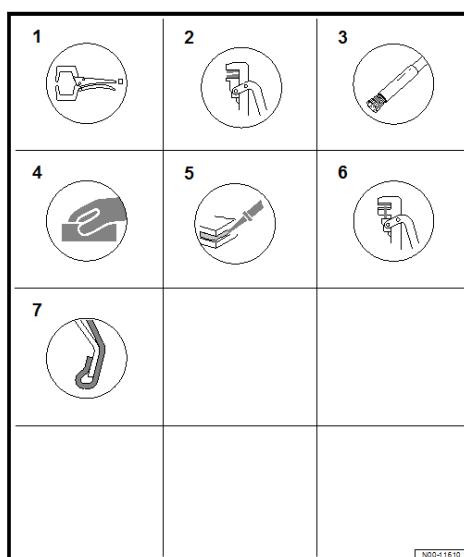
- 1 - Solid Rivet
- 2 - Punch rivet
- 3 - Use rivet pliers
- 4 - Pop Rivet



N00-11609

### 3.4 Preparation, Symbols

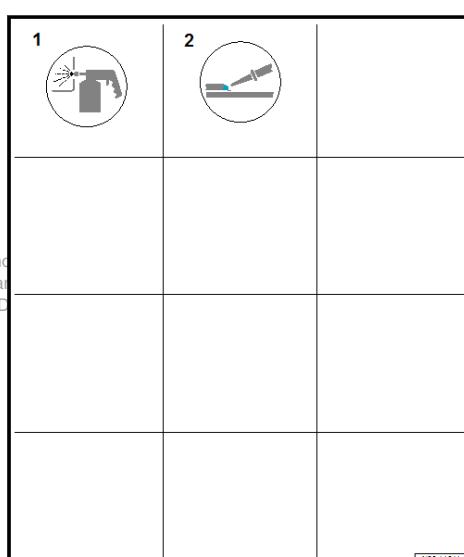
- 1 - Clamping
- 2 - Setting
- 3 - Removing paint on hard-to-reach areas
- 4 - Sanding by hand
- 5 - Applying adhesive
- 6 - Perforating
- 7 - Flanging



N00-11610

### 3.5 Corrosion Protection, Symbols

- 1 - Sealing Cavities
- 2 - Sealing



N00-11611

## 4 Materials Used, Overview

⇒ "4.1 Galvanized Body Parts", page 7

⇒ "4.2 Deep-Drawing Steels", page 7

⇒ "4.3 High Strength and Ultra-High-Strength Steels", page 7

⇒ "4.4 Ultra-High-Strength Hot-Formed Steel Panels", page 8

⇒ "4.5 Aluminum", page 8

⇒ "4.6 Multi-Material Mix", page 8

### 4.1 Galvanized Body Parts

Fully galvanized body parts enable a high level of corrosion protection in the shell construction. To maintain the warranty against perforation corrosion, the procedures in chapter ⇒ Rep. Gr. 52 ; Corrosion Protection on Attachments and Welded Parts must be followed precisely.

### 4.2 Deep-Drawing Steels

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Body and floor assembly in series production are produced predominantly from cold-formed deep-drawing sheet metal. For this reason, reshaping accident damage should be carried out opposite the direction of the damage. If the size of the damage does not allow it to be reshaped opposite the direction of damage, then the damaged part may be removed only after straightening procedures are performed on the connecting surfaces.

### 4.3 High Strength and Ultra-High-Strength Steels

High-strength steel is used in these vehicles. Areas in which this steel is used are specified in the vehicle-specific repair manual body repair. Refer to ⇒ Body Repair; Rep. Gr. 00 ; Body Parts and Materials; Galvanized Body Parts and High and Higher-Strength Body Panels .

#### High-strength sheet metal panel

Optically conventional steel, but it has a higher yield point than conventional body panels because of various alloys. This means, with the same force applied to the steel, the dent in the high-strength body panel is not as deep as that in a conventional body panel.

#### To keep in mind during dent removal

Dents are removed with standard tools. Due to the higher dent resistance, there is greater rebound characteristic so that it may be necessary to expend more force. When buckled areas are reshaped, breaks in the material may occur.

#### What to keep in mind when straightening with a straightening rack or hydraulic press

Due to a greater rebound characteristic of high-strength panels, it must be stretched more than a conventional panel before it remains in the desired position. Due to the higher application of force, conventional panels that are welded together with high-strength panels are also strained more. In order to prevent conventional panels from yielding or tearing, an additional anchor must be provided.

- ◆ If a high-strength panel is stretched too much, it suddenly springs into a longer length than desired, unintentionally.
- ◆ For safety reasons, high-strength body panels must not be heated when reforming as with conventional body panels.

- ◆ Welding high-strength steel according to the vehicle-specific body repair manual with the specified separation cuts and welding procedures is permitted.

#### 4.4 Ultra-High-Strength Hot-Formed Steel Panels

Steel panels that are formed in a warm condition at temperatures between 900 °C and 950 °C (1,652 °F and 1,742 °F). The steel panels gain their high strength through a specific cooling process in the reshaping tool. They are form hardened. The vehicle weight is reduced without losing strength by using ultra-high-strength hot-formed steel panels. Only spot welding machines with inverter technology must be used for vehicles with ultra-high-strength hot-formed steel panels

#### 4.5 Aluminum

Aluminum is used in vehicle bodies to reduce weight and to increase body stiffness.

In vehicle construction, a distinction is made between:

- ◆ Aluminum sheet metal
- ◆ Aluminum extrusion profiles (may not be reformed)
- ◆ Aluminum cast parts (may not be reformed)

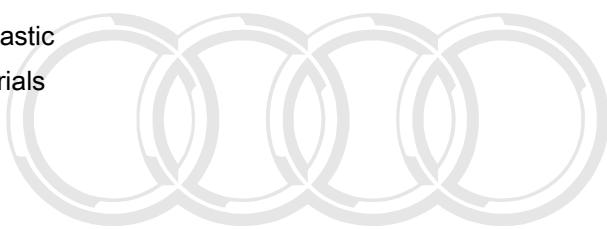
The properties of these components are fundamentally different. If damage occurs, it is necessary to pay attention to the vehicle-specific body repair manuals.

#### 4.6 Multi-Material Mix

In addition to a pure steel bodies, there is an increase in mixed-material body construction. This means that a combination of various materials are being used together.

The most common materials in modern vehicle bodies are:

- ◆ Steel (in varying strengths)
- ◆ Aluminum
- ◆ Magnesium
- ◆ Plastic
- ◆ Fiber-reinforced plastic
- ◆ Carbon fiber materials

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## 5 Joining and Separation Processes

- ⇒ [“5.1 Drilling”, page 9](#)
- ⇒ [“5.2 Sawing”, page 9](#)
- ⇒ [“5.3 Sanding”, page 10](#)
- ⇒ [“5.4 Milling”, page 10](#)
- ⇒ [“5.5 Bonded Joints, Detaching”, page 10](#)
- ⇒ [“5.6 Removing Rivets Accessible on One Side”, page 11](#)
- ⇒ [“5.7 Resistance Spot Welding”, page 11](#)
- ⇒ [“5.8 Plug Welding, Gas-Shielded”, page 12](#)
- ⇒ [“5.9 Arc Continuous and Stitch Weld Seams, Gas-Shielded”, page 12](#)
- ⇒ [“5.10 Aluminum Welding”, page 13](#)
- ⇒ [“5.11 Solid Rivet”, page 13](#)
- ⇒ [“5.12 Pop Rivet”, page 14](#)
- ⇒ [“5.13 Rivet Problems”, page 15](#)
- ⇒ [“5.14 Kerb-Konus Rivets”, page 17](#)  
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- ⇒ [“5.15 Overview of Rivet Heads”, page 17](#)
- ⇒ [“5.16 Repair Kit for Flow-Drill-Connections”, page 18](#)
- ⇒ [“5.17 Flow Drill Bolts”, page 18](#)
- ⇒ [“5.18 Creating a Flow drill Bolt Connection, Upper Section Pre-Punched”, page 19](#)
- ⇒ [“5.19 Creating a Flow Drill Bolt Connection, Upper Section Not Pre-Punched”, page 19](#)
- ⇒ [“5.20 Creating a Flow Drill Bolt Connection, When Replacing the Upper and Lower Section”, page 20](#)
- ⇒ [“5.21 Friction Element Welded Connection, Replacing”, page 20](#)

### 5.1 Drilling

Drilling is used to loosen resistance weld spots and rivets. Make sure no underlying components are damaged while drilling. When loosening two layered or more welded connections, the panel remaining on the vehicle must not be impaired. After drilling, carefully remove any drill shavings from the cavities using suction.

Protect magnetic components from shavings.

### 5.2 Sawing

After sawing, carefully remove any saw shavings from the cavities using suction.

Protect components from shavings

**Short stroke pneumatic saw:**

- ◆ Fast separation
- ◆ Possible to saw curves
- ◆ Can also be used for sharply angled profiles.

#### Oscillating saw:

- ◆ Clean, straight cuts
- ◆ Low penetration depth, therefore it is particularly suitable for double-layer panels.

### 5.3 Sanding

Sanding can be an alternative to drilling, especially when loosening high-strength welded connections. Weld points, laser weld connections, or brazed seams can be loosened by sanding. Make sure that the underlying materials are not impaired or damaged.

Protect magnetic components from shavings.

- ◆ Due to the flying sparks, extensive protective measures are necessary on the vehicle and in the surrounding area.
- ◆ Higher temperature build-up than when drilling, thus more damage to residual material and corrosion protection.

### 5.4 Milling

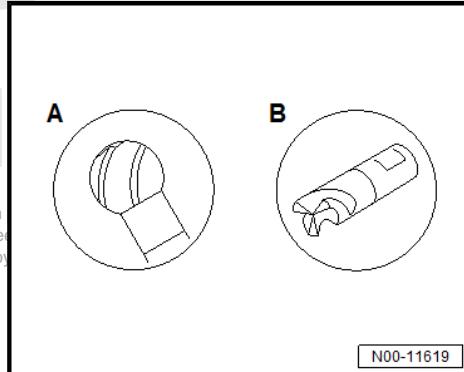
In body repairs, the technician decides between a ball end nose mill -A- and a BTR mill -B-.

A ball end nose mill is used if the spatial conditions do not allow the BTR mill to be used for loosening weld points.

When working with the BTR mill, it must be made sure that cuts do not tilt into the high-strength steel. They can break easily due to the hardness of the cuts. Always work with a suitable tool (no hand drill).

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Protect magnetic components from shavings.



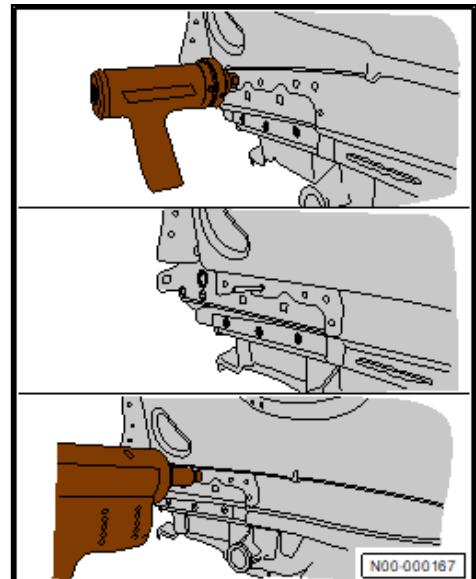
### 5.5 Bonded Joints, Detaching

Body bonded joints can be detached by applying heat.

- ◆ Wear protective gloves and eyewear.
- ◆ Avoid direct contact of the adhesives with the skin.
- ◆ Avoid inhaling solvent vapors.
- ◆ Only process adhesives in well-ventilated areas.
- ◆ Pay attention to the manufacturer's hazard information.
- ◆ Note the accident prevention regulations applicable in the respective country.
- ◆ Pay attention to the respective adhesive safety data sheets.

## 5.6 Removing Rivets Accessible on One Side

- ◆ Remove the paint and oxide coating from the rivet head and the connection point for the ground clamps.
- ◆ Bring the ground clamps as close as possible to the rivets.
- ◆ Weld the weld studs onto the rivet.
- ◆ Remove the rivet using the welding stud.



## 5.7 Resistance Spot Welding

The basic principle of restoring as much of the original welded connection as possible applies when performing welding body repair work.

### Condition

- During body repair work, access to weld points varies. Therefore, a complete set of the most common types of electrodes must be present.
- Pay attention to the welding tool manufacturer's owner's manual and adjustment notes.

**The following requirements must be met for restoring the original welded connections:**

- ◆ The position of the original welded connections must be transferred to the new part. Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
- ◆ The welded panels must overlap.
- ◆ Both sides of the weld point are accessible for the electrodes.
- ◆ Electrodes must be attached at a right angle.
- ◆ The resistance spot welder is strong enough to produce weld spot diameters like at the factory.

### Zinc-Coated Panels, Straight-Line Welding

When performing resistance spot welding on zinc-coated panels, observe following points:

- ◆ Splashes on the surface or splashes on the side of the electrodes must be avoided.
- ◆ Avoid melted through weld points.
- ◆ Avoid surface cracks.
- ◆ The flanges to be spot welded must touch.

- ◆ If necessary, tension the flanges with pliers. This is important with high-strength panels because the electrode strength is not great enough otherwise.
- ◆ Do not weld directly by the clamping pliers with the welding tongs because a large amount of the welding current flows through here due to shunting.
- ◆ With small spot weld spacing, weld in a sequential order or weld every third point to secure and then finish welding. This minimizes the shunting influence.
- ◆ If a weld point is faulty, then a new weld point can be placed at a sufficient distance (at least 20 mm if possible)

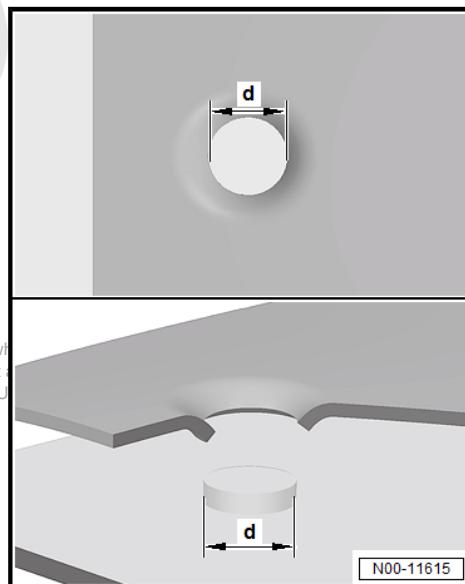
#### Test Button Weld

- ◆ For the necessary panel pairing button weld diameter, determine the welding tool settings parameters based on the panel thickness and check with test panels.
- ◆ Qualitatively acceptable spot welds do not tear into the contact surface, but rather "unbutton".

#### Calculate the button weld diameter -d-:

- ◆ Root from  $d = T_1 * 3.5 * 1.15$

T1 is the thinnest panel in a panel combination, for example, panel combination of 1.5 mm and 0.8 mm. Example calculation:  
 root of  $0.8 \times 3.5 \times 1.15 = 3.6$  mm button weld diameter. With  
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## 5.8 Plug Welding, Gas-Shielded

Gas-shielded plug welding is used if standard implemented resistance spot welds cannot be recreated, for example due to limited accessibility.

- ◆ Loosen the weld points with a spot weld cutter or sand off.
- ◆ Removing the damaged part.
- ◆ Sand down projections.
- ◆ Adapt the new part.
- ◆ Drill/stamp the top panel for plug welding (refer to the vehicle-specific body repair manual for the hole diameters).
- ◆ Clean the flanges and remove the oxide coating.
- ◆ Perform plug welding from center outward.

## 5.9 Arc Continuous and Stitch Weld Seams, Gas-Shielded

Gas-shielded arc continuous and stitch weld seams are used when joining butt-welded or overlapping separating points. Due to the very high welding temperatures and the altered material properties for modern materials associated with it, there is increasingly limited use of this joining process. Pay attention to the vehicle-specific body repair manual here.

## 5.10 Aluminum Welding

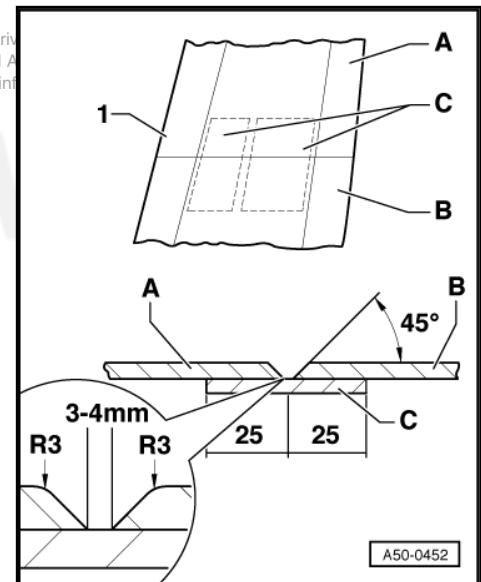
Metal Inert Gas (MIG) welding is used by the manufacturer and in service.

Argon is used as inert gas.

- ◆ Before welding, remove any underbody protection and paint from the components.
- ◆ Then remove the approximately 40 mm of oxide layer on both sides using a stainless steel brush.
- ◆ Always draw weld seams around profile corners to avoid the formation of cracks.

### Same Material, Underlying

- ◆ Aluminum panel -1-
- ◆ Same material -C- is created from remainder of new B or old parts -A-. Same material should also be underlaid on beaded panel edges. On small cross sections or large panel edges, the same material is separated.
- ◆ Bevel both panels 45°. Round outer edge (radius = -R3-) and chamfer inner edge.
- ◆ Panel tips must be 3 to 4 mm apart.



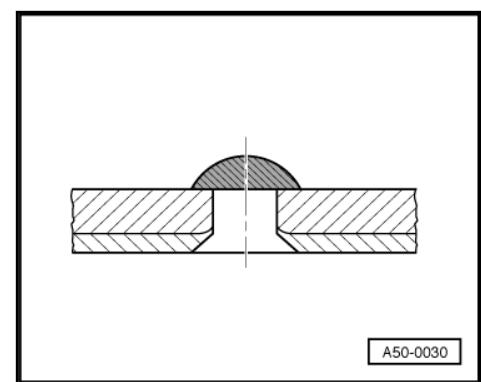
## 5.11 Solid Rivet

### Condition

- Adjust the rivet tool to material thickness for all procedures. Insert the staples into the punched holes to prevent the flange from gaping after stamping.

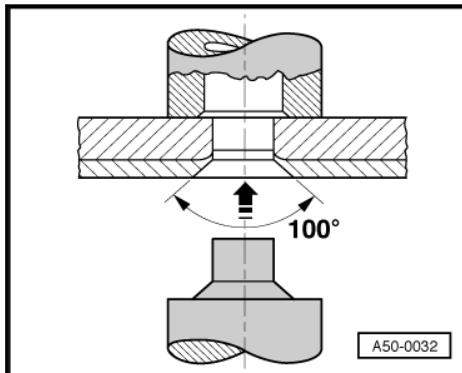
### Opening the solid rivet

- ◆ Make separating cuts, if necessary.
- ◆ Sand off closing head and press out the solid rivet with the rivet tool.
- ◆ Remove the damaged part, separate with a chisel if necessary.

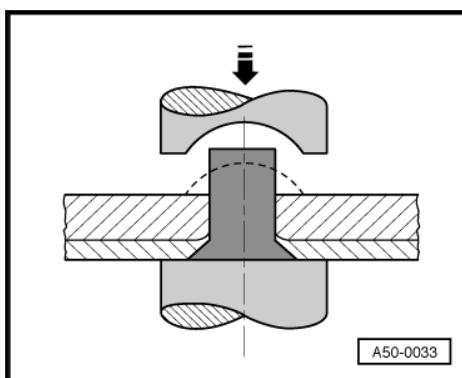


### Solid Rivet, Installing

- ◆ Fit new parts, apply adhesive and place new part on body and secure.
- ◆ Stamp the flange with the rivet tool.
- ◆ When stamping, the punch hole and the imprint are made in one process.



- ◆ Insert the solid rivet and affix the closing head using the rivet tool.
- ◆ There are corresponding rivet tool inserts for the various rivet diameters.



## 5.12 Pop Rivet

### Opening the pop rivet

#### Condition

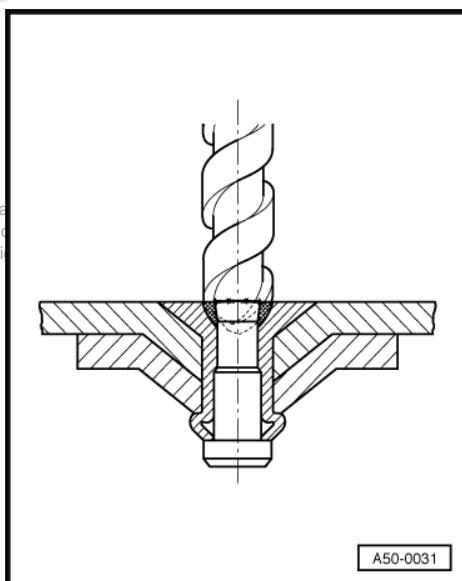
- Catch pop rivet remnants. If remnants fall into the cavities and can no longer be removed, they must be worked into the filler wax.
- ◆ Perform separation cuts, if necessary.
- ◆ Drill out the pop rivet, drill bit diameter 4.5 mm.
- ◆ Remove the damaged part, separate with a chisel if necessary.

### Pop Rivet, Installing

#### Condition

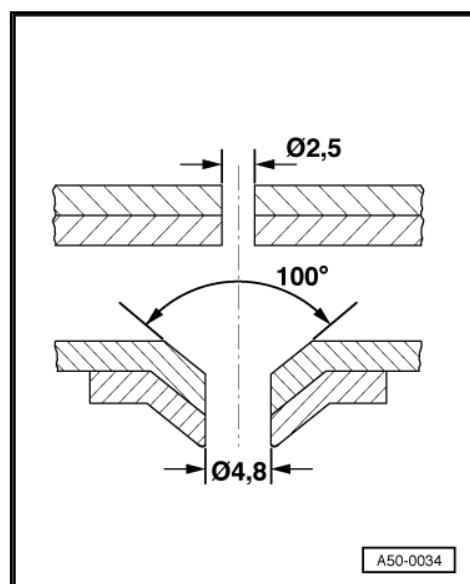
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- Adjust the rivet tool to material thickness for all procedures. The diameter increases to 4.8 mm with imprinting. The imprint must face inward on all parts.
- Assembly sections cannot be imprinted. Lower the new part with assembly section, remove part and drill out the assembly section to 4.8 mm diameter.



Different pop rivets are available

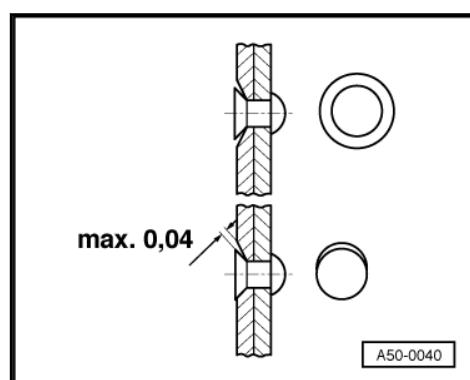
- ◆ Fit new parts, place on body and secure.
- ◆ Drill old and new part or same material at the same time, 2.5 mm diameter.
- ◆ Remove the new parts.
- ◆ Imprint drilled holes in all parts with rivet tool.
- ◆ Apply the adhesive.
- ◆ Insert the pop rivet and pull the pin with rivet pliers.



## 5.13 Rivet Problems

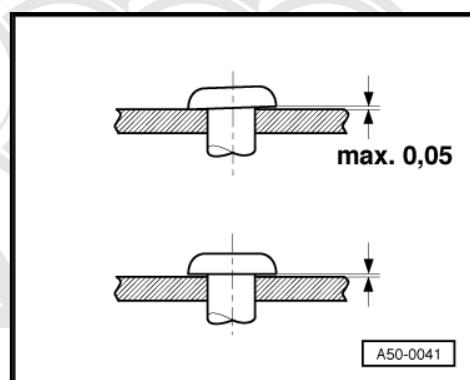
### Open countersinks

- ◆ Open countersinks over the entire circumference are not permitted. Partially open countersinks up to a gap width of 0.04 mm are permitted.
- ◆ Sizing, for example, with a cambered die, is permitted as long as the tolerance for closing and setting head are maintained.



### Non-fitting rivet heads

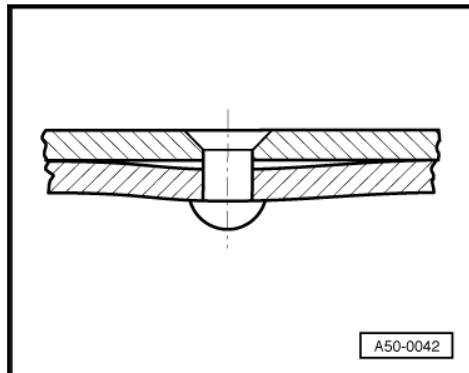
- ◆ Loose rivets are never permitted.
- ◆ A partial gap up to 0.05 mm is permitted.



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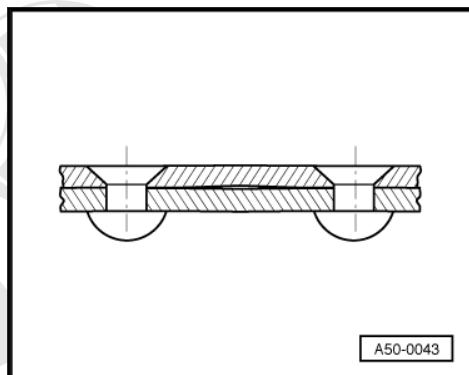
### Bulges at the rivet connection

- ◆ During the riveting process, the rivet material is pushed into the gap and causes bending stress to the rivet.
- ◆ This type of bulge is not permitted.



### Bulges between the rivet connections

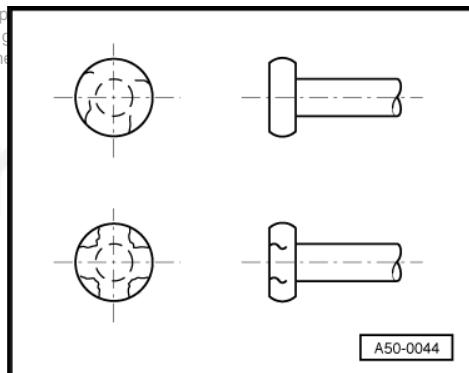
- ◆ Bulges may not exceed a gap width of 0.3 mm.



### Shear cracks

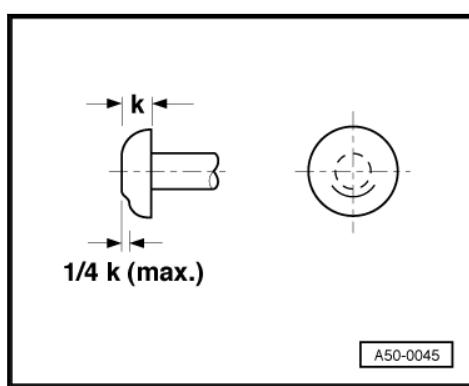
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- ◆ Cracks that do not overlap are permitted (top).



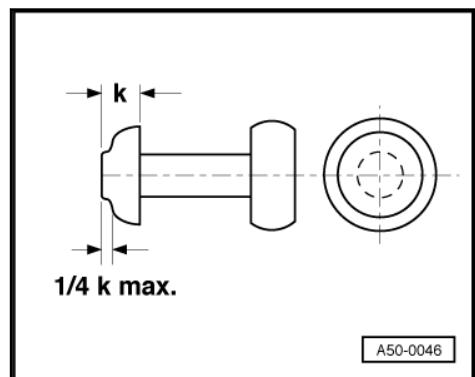
### Notches

- ◆ The permitted notch depth is  $1/4 * \text{height of the head } - k -$ .



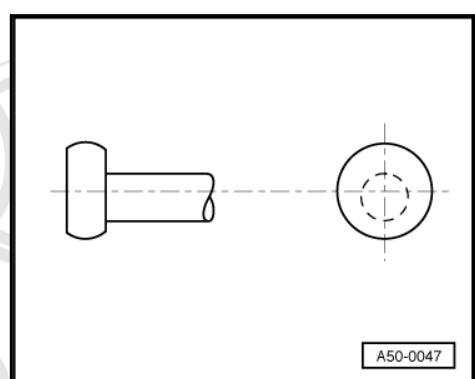
### Rings

- ◆ Rings form in the head when a riveting header is used that is too small.
- ◆ The permitted depth of the rings is  $1/4 * \text{height of the head}$  -k-.
- ◆ The fully formed ring is not permitted.



### Offset closing head

- ◆ An offset closing head is not permitted if the closing head touches the shaft and the rivet hole is visible.



## 5.14 Kerb-Konus Rivets

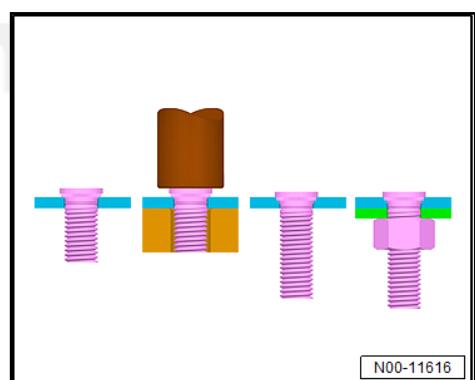
### Condition

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- Due to the corrosion risk, stainless steel rivets may not be drilled out or sanded.

Riveting processes (from the left to the right)

- ◆ Setting the rivet
- ◆ Pressing process
- ◆ Inserting and punching out
- ◆ Finished Kerb-Konus connection



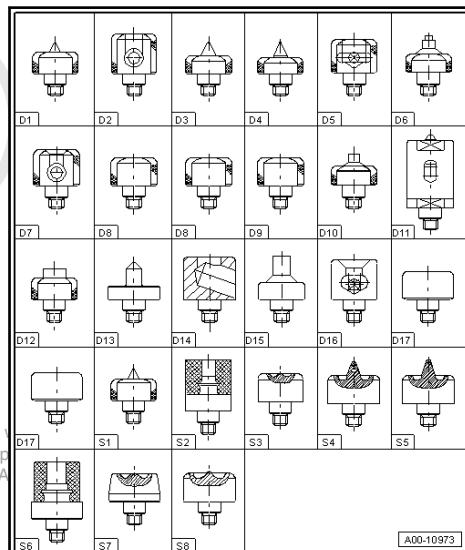
## 5.15 Overview of Rivet Heads

The pairings listed are only used as a guide. Use the accompanying Owner's Manual for the description of the procedure as well as the areas of application.

### Condition

- Use commercially available cutting oil to increase the service life of the rivet head maker.

- ◆ D 1 + D 2 - 3.2 mm diameter press - punch rivet
- ◆ D 2 + D 3 - 3.2 mm diameter press - punch rivet
- ◆ D 2 + D 5 - 5 mm diameter press - punch rivet
- ◆ D 3 + D 5 - 5 mm diameter press - punch rivet
- ◆ D 4 + D 5 - 5 mm diameter press - punch rivet
- ◆ D 5 + D 12 - 8 mm diameter hole punch - welded joint drill
- ◆ D 6 + D 7 - 4.8 mm diameter hole stamp - pop rivet
- ◆ D 8 + D 8 - panel reshaping
- ◆ D 8 + D 9 - pressure of 4 mm diameter - solid rivet
- ◆ D 10 + D 11 - Previously copyrighted. Copying for private or commercial purposes, in part or in whole, is only permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept responsibility with respect to the correctness of information in this document. Copyright by Audi AG. hole punch and stamp 4 mm diameter - solid rivet
- ◆ D 13 + D 14 - 5.3 x 7.5 mm diameter press - punch rivet
- ◆ D 17 + D 17 - panel reshaping
- ◆ D 15 + D 16 - 6.0 mm diameter hole stamp - solid rivet
- ◆ D 17 + D 17 - pressure of 6.0 mm - solid rivet
- ◆ S 1 + D 2 - 3.2 mm diameter press - punch rivet
- ◆ S 2 + S 3 - 3.2 mm diameter positioner - punch rivet
- ◆ S 4 + D 5 - 5.3 x 5.5 mm diameter press - punch rivet
- ◆ S 5 + D 5 - 5.3 x 6.5 mm diameter press - punch rivet
- ◆ S 6 + S 7 - 5.3 x 5.5 mm diameter positioner - punch rivet
- ◆ S 6 + S 8 - 5.3 x 6.5 mm diameter positioner - punch rivet



## 5.16 Repair Kit for Flow-Drill-Connections

The flow drill socket repair set serves as a means of marking the holes on the new parts where the flow drill bolt threaded connections are used. Using the hole finder, it is possible to transfer the hole positions for the flow drill bolts to the aluminum vehicles if a repair is required.

The old flow drill bolts are removed using the respective flow drill bolt socket set. Then the damaged panel is removed. Now the hole finder is installed in the existing holes in the aluminum panel.

The new aluminum panel is aligned to the vehicle and attached with locking pliers. Using light hammer strokes (rubber hammer), the holes from the existing panel will be transferred onto the replacement part with assistance from the hole finder. The replacement part that now contains the marks is removed again. Holes are drilled at the transferred marks.

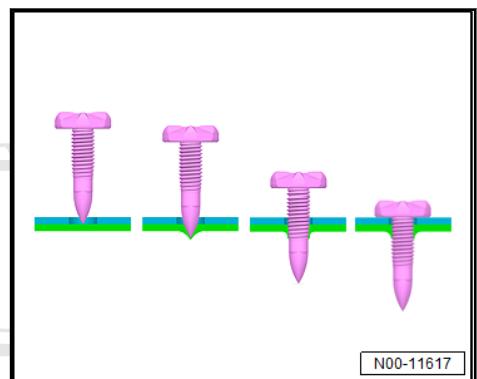
Then it is possible to secure the new part on the body using the flow drill bolt socket.

## 5.17 Flow Drill Bolts

For flow drill bolts, the lower component is heated from the heat due to friction of the turning bolt and the self-tapping bolt is screwed into the soft aluminum.

Flow Drill Bolt Connections (FDS), Servicing

- ◆ Refer to ⇒ Rep. Gr. 52 ; Creating a Flow drill Bolt Connection, Upper Section Pre-Punched .
- ◆ Refer to ⇒ Rep. Gr. 52 ; Creating a Flow Drill Bolt Connection, Upper Section Not Pre-Punched .
- ◆ Refer to ⇒ Rep. Gr. 52 ; Creating a Flow Drill Bolt Connection, When Replacing the Upper and Lower Section .



## 5.18 Creating a Flow drill Bolt Connection, Upper Section Pre-Punched

- ◆ Loosen the flow drill bolt threaded connection using a socket for flow drill bolts.
- ◆ Remove the upper section.
- ◆ Preparing the connection points for applying adhesive.
- ◆ Clean the adhesion area with cleaning solution.
- ◆ Apply two-part epoxy adhesive to the entire area.
- ◆ Position the new part and connect with a suitable pop rivet.

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Diameter	Part Number	Clamping area
Diameter 6.5 mm	WHT.005.697	2.8 mm - 4.8 mm
Diameter 6.5 mm	N 911.527.01	4.7 mm - 7.00 mm
Diameter 6.5 mm	N 904.692.02	6.8 mm - 8.8 mm

## 5.19 Creating a Flow Drill Bolt Connection, Upper Section Not Pre-Punched

- ◆ Loosen the flow drill bolt threaded connection using a socket for flow drill bolts.
- ◆ Remove the upper section.
- ◆ Insert the hole finder into the existing flow drill bolt threads. Allow for the flow drill bolt repair set offset: only make a superficial mark if possible.
- ◆ Position the new part.
- ◆ Label the holes in the new part by hitting it lightly with a plastic hammer.
- ◆ Remove the upper section.
- ◆ Drill 6.5 mm diameter holes in the new part.
- ◆ Preparing the connection points for applying adhesive.
- ◆ Clean the adhesion area with cleaning solution.
- ◆ Apply two-part epoxy adhesive to the entire area.
- ◆ Position the new part and tighten using the flow drill bolt socket and gradually tighten new bolts to 5 Nm.
- ◆ If the tightening specification is not reached, replace the flow drill bolts with a pop rivet.

Diameter	Part Number	Clamping area
Diameter 6.5 mm	WHT.005.697	2.8 mm - 4.8 mm

Diameter 6.5 mm	N 911.527.01	4.7 mm - 7.00 mm
Diameter 6.5 mm	N 904.692.02	6.8 mm - 8.8 mm

## 5.20 Creating a Flow Drill Bolt Connection, When Replacing the Upper and Lower Section

- ◆ Loosen the flow drill bolt threaded connection using a socket for flow drill bolts.
- ◆ Remove both sections.
- ◆ Using both parts at the same distance as with the original joint, make 6.5 mm diameter holes.
- ◆ Remove the new parts.
- ◆ Preparing the connection points for applying adhesive.
- ◆ Clean the adhesion area with cleaning solution.
- ◆ Apply two-part epoxy adhesive to the entire area.
- ◆ Position the new part and connect with a suitable pop rivet.

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Diameter	Part Number	Clamping area
Diameter 6.5 mm	WHT.005.697	2.8 mm - 4.8 mm
Diameter 6.5 mm	N 911.527.01	4.7 mm - 7.00 mm
Diameter 6.5 mm	N 904.692.02	6.8 mm - 8.8 mm

## 5.21 Friction Element Welded Connection, Replacing

Friction element welded connections are used with multi material shells to connect high strength steels with aluminum parts. A distinction is made between standard friction elements and countersunk head friction elements.

## 6 Surface Repair

- ⇒ [“6.1 Dent Removal Technique for Steel Panels”, page 21](#)
- ⇒ [“6.2 Pressing Bulge Correction Procedure, without Paint Damage”, page 21](#)
- ⇒ [“6.3 Bulge Correction Procedure, Exterior Dent Correction and Pulling”, page 21](#)
- ⇒ [“6.4 Bulge Correction Procedures for Aluminum Panels”, page 21](#)
- ⇒ [“6.5 Accurately Contoured Surface Definition and Transfer to Paint Shop”, page 22](#)

### 6.1 Dent Removal Technique for Steel Panels

Classic dent removal method using a hammer and counterhold is rarely used on modern vehicle bodies.

The disadvantage of this technique is that usability is limited (depending on construction) as well as the overextension of materials required by this method. The resulting excess of material must often be thermally reduced, which in turn results in considerable disadvantages for the material strength and corrosion protection.

### 6.2 Pressing Bulge Correction Procedure, without Paint Damage

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This dent removal method that does not cause paint damage is mostly used for minor parking and hail damage. When doing this the dent is softly pressed outward from the inside. The pressing is done circularly around the center of the dent in multiple stages so that there is no formation of cracks in the paint during reshaping.

### 6.3 Bulge Correction Procedure, Exterior Dent Correction and Pulling

The exterior bulge correction procedure is used as a bonding technique without damage as well as a method with paint damage, due to pulling aids being attached. The method selection depends on the type of damage. For both procedures, the dent is pulled out of the panel from the outside. The long reshaping process significantly reduces the tension in the material structure. It is also referred to as soft or no-shock reshaping.

Advantages of these bulge removal methods:

- ◆ Overstretching of material is reduced
- ◆ Minimal corrosion protection damage.
- ◆ Minimal disassembling of the vehicle.
- ◆ Preservation of the original joint.

### 6.4 Bulge Correction Procedures for Aluminum Panels

Condition

- Aluminum parts must be covered when sanding and welding steel parts. Any steel shavings that contact aluminum must be immediately removed or else contact corrosion can occur.

- Use separate tools for steel or aluminum
- Do not exceed the maximum heat of 150 °C (302 °F) during retraction. Otherwise, the component may become damaged.
- Replace the part if a tear forms when removing dents.

The dent removal techniques for aluminum components are not fundamentally different than those for steel components. However, due to the different material properties, several points must be noted:

- ◆ The risk of material expansion is greater with aluminum than with steel.
- ◆ Sharp-edged and hard dent removal tools (for example, steel hammer) should be avoided and should be replaced with plastic, wood or aluminum hammers.
- ◆ In contrast to steel, dent removal procedures on aluminum panels start at the center of the dent.
- ◆ If the material stretches, this can be corrected by applying heat and retracting.

### Controlling Temperature When Heating

#### Condition

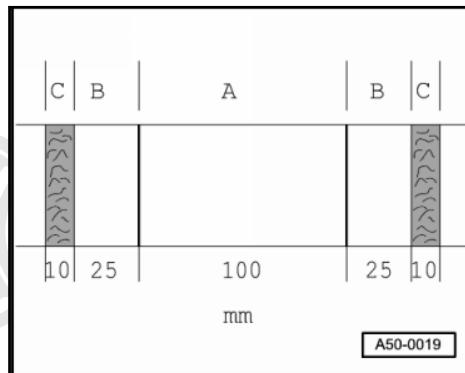
- No tempering colors can be recognized when heating aluminum. Therefore, the temperature must be determined using thermo-strips.

Thermo-strips change color at specific temperatures.

A - Warming area

B - Free zone

C - Thermo-strips



## 6.5 Accurately Contoured Surface Definition and Transfer to Paint Shop

The contoured surface is a surface with the dimensional accuracy of the edges and seams to the surface.

It is specified when:

- ◆ Any surfaces or parts that have been worked on, such as removing dents, welding or spackling, must be dry sanded with minimum P 80 grit sandpaper.
- ◆ The vehicle paint shop technician must then re-create the respective surface in a maximum of two steps.

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## 7 Corrosion Protection

⇒ ["7.1 Corrosion Protection on Attachments and Welded Parts", page 23](#)

⇒ ["7.2 Sealing Cavities", page 23](#)

### 7.1 Corrosion Protection on Attachments and Welded Parts

- ◆ Prime bare panel surfaces immediately after the repair.
- ◆ Holes must be deburred.
- ◆ Always apply welding primer/structure adhesive to the welding flanges on both sides (according to the vehicle-specific body repair manual).
- ◆ Prime the weld area on inside and outside before sealing.
- ◆ Apply sealant only to primed panels.
- ◆ Completely seal panel overlap, panel edges, butt joints, weld seams, etc. with sealant.
- ◆ The weld seams may not be sanded, as otherwise the strength of the weld seam will be impaired.
- ◆ Create the paint structure according to the paint manual. Refer to ⇒ General Information - Paint; Rep. Gr. 54 ; General Information; Service Painting Paint Structure  
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- ◆ Restore the underbody protection with long-term underbody protective material.
- ◆ Apply protective material to all cavities in repair area after finish painting.
- ◆ Protective material must be completely applied on separation cuts (for example, in side panel).
- ◆ Open water drains after cavity sealant material dries.

### 7.2 Sealing Cavities

#### Condition

- Before beginning the process, it is required to become familiar with the safety information sheet covering safety precautions.
- Even for products which are not required to be labeled by law, the usual safety measures must be observed for chemical emissions.
- Function components such as brake systems, exhaust systems, rubber or plastic parts, must not be spayed.
- ◆ Dripping cavity sealant can be easily wiped away.
- ◆ Approved adhesive remover should be used to clean off any drips on material.
- ◆ Larger surfaces can be cleaned with a steam cleaner.  
Splashes on painted surfaces should be removed immediately.

## 8 Noise Insulation for Noise Reduction

⇒ “8.1 Noise Insulation for Inside of Outer Door Panel, Removing and Installing”, page 24

### 8.1 Noise Insulation for Inside of Outer Door Panel, Removing and Installing

#### Special tools and workshop equipment required

- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-

The noise insulation for the inner door panel will be called noise insulation in the information that follows.

#### Condition

- Comply with procedures and guidelines. Refer to ⇒ General Information - Body; Rep. Gr. 52; Components with Adhesive Tape; Specifications for Components with Adhesive Tape .

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#### Removing

- Measure the dampening position and note it down.
- Warm the seal using the Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- .
- Remove the noise insulation from the inside of the outer door panel.

#### Installing

Install in the reverse order of removal, while noting the following:

#### If a new door will be installed:

- Transfer the position and dimension of the adhesive surface from the removed door.

#### Continuation

- Remove the adhesive residue and clean the adhesive surfaces.
- Cut the seal and place it on the adhesive surface.

**"Aluminum-clad" noise insulation:**

- Remove the protective film from the adhesive tape.
- Push the noise insulation using force on the inside of the outer door panel.

---

**Continuation for all vehicles**

**"Bitumen" noise insulation**

**Tip**

For bitumen, the processing temperature is 140 °C (284 °F).

- Warm up the noise insulation using the Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- and then press firmly onto the inside of the outer door panel.



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## 9 Plastic Repair

- ⇒ [“9.1 Introduction”, page 26](#)
- ⇒ [“9.2 Distinction of Plastic Types”, page 26](#)
- ⇒ [“9.3 Processing Guidelines - Original Products”, page 32](#)
- ⇒ [“9.4 Plastic Repairs, Preparing”, page 33](#)
- ⇒ [“9.5 Distortion, Servicing”, page 35](#)
- ⇒ [“9.6 Plastic Attachments, Bonding”, page 38](#)
- ⇒ [“9.7 Plastic Attachments, Welding”, page 44](#)

### 9.1 Introduction

The high percentage of the body attachments made of plastics requires knowledge of material properties and repair techniques.

There are two procedures for plastic repairs at body attachments:

- ◆ Welding
- ◆ Bonding

It depends on the kind of damage and type of plastic, which technique of plastic repairs must be used. That is why it is important to know the various types of plastic and their characteristics relating to the repair techniques.

Plastic attachments with a structured surface can be repaired. The quality standard of the surface after a plastic repair cannot reach the quality standard of a new part.

### 9.2 Distinction of Plastic Types

Plastics are differentiated into the following due to their chemical structure and their behavior when heated:

- ◆ Thermoplastics
- ◆ Duroplastics
- ◆ Elastomers

Thermoplastics and duroplastics are often used in the automotive industry.

Elastomers are currently limited in the automotive industry.

Furthermore, composite materials are also used in the automotive industry.

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## Identification

Most of the plastic attachments are labeled with a standard code -5-. The standard code -5- tells us the composition and is located on the inside of the plastic attachment.

### Condition

- In order to view the standard code -5-, it may be necessary to remove the plastic attachment.

The standard code -5- includes plastic type, additives or strengtheners. The standard code consists -5- consists of the symbol ">", an abbreviation for the type of plastic and ends with the "<" symbol. The abbreviation stand for:

- ◆ Base polymer
- ◆ Special features
- ◆ Type, composition and strengthener percentage

### Base polymer

Designates the polymer or the polymer mixture, from which the plastic attachment was made.

For polymer mixture (blends):

- ◆ the individual polymers are separated by the symbol "+"
- ◆ they are specified in descending order of the proportion.

### Example >PP+EPDM<:

An alloy consisting of Polypropylene -PP and Ethylene Propylene Diene rubber (EPDM). The main component is Polypropylene.

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### Special features

Special features of a base polymer, for example foamed, chlorinated, high density or low density, are added to the base polymer after a dash "-".

### Example >PE-HD<:

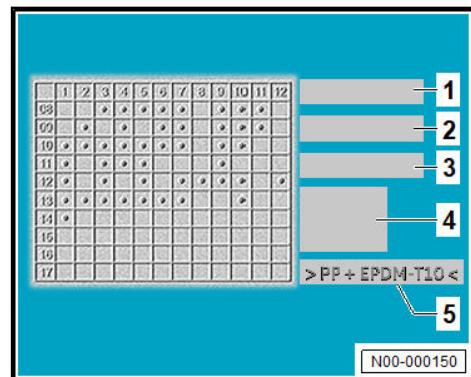
A Polyethylene with high density. Abbreviations of the special features can also be added to the actual Polymer, for example >HDPE<.

### Continuation for all vehicles

### Type, composition and strengthener percentage

Strengthener additives are listed with one to two letters after the Polymer. The letters are separated by a dash "-" and listed before the base Polymer. The first letter refers to the type of additive and the second letter refers to the composition of the additive.

Abbreviations of the additives, strengtheners and composition:



Abbreviation	1. Letter	2. Letter
B	Boron	<ul style="list-style-type: none"> <li>◆ Pearls</li> <li>◆ Tablets</li> <li>◆ Balls</li> </ul>
C	Carbon	<ul style="list-style-type: none"> <li>◆ Pieces</li> <li>◆ Chips</li> </ul>

Abbreviation	1. Letter	2. Letter
D	Aluminum Trihydride	Powder
E	Clay	- <sup>1)</sup>
F	_a)	Fiber
G	Glass	Crushed Material
H	_a)	Single Crystal Short Fiber
K	Calcium Carbonate	Netting
L	Cellulose	Layer
M	◆ Mineral ◆ Metal	Felt
N	_a)	Not Woven (Fabric)
P	Glimmer	Paper
Q	Silicate	_a)
R	Aramid	Wound
S	Organic-Synthetic	◆ Flake ◆ Slat
T	Talcum	Twined or Plaited Material, Cord
V	_a)	Panel
W	Wood	Fabric
X	Without Information	
Y	_a)	Thread
Z	Miscellaneous	

Plastic reinforced by fiberglass is labeled with the letters "GF" and the percentages/proportions of the additive.

#### Example >UPGF30<:

An unsaturated polyester (UP) contains a fiberglass strengthening of 30 %.

#### Continuation for all vehicles

Another additive is talcum. Talcum is labeled with the letter "T" or "TD", if in powder form.

#### Example >PP-T10<:

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#### Continuation for all vehicles

#### Thermoplastics

Thermoplastics are plastics that are brittle at a normal temperature or viscoplastic plastics, which can be softened and formed when heated. After cooling down, thermoplastics harden again and retain their original characteristics.

If thermoplastics come into contact with solvents, they can dissolve or swell.

#### Condition

If thermoplastics are welded:

- the material must be determined in order to determine the appropriate welding rod material and welding temperature.

A higher mechanical stability can be reached by welding in comparison to bonding. It is recommended to weld cracks or tears in thermoplastics.

Characteristics and areas of application:

Designation	Abbreviation	Properties	Areas of application
Polyethylene	PE	<ul style="list-style-type: none"> <li>Excellent electric characteristics</li> <li>High stability against water and humidity</li> <li>Low temperature stability</li> </ul>	Fuel tanks, wheel housing trim panels, bumper covers, air guides
Polypropylene	PP	<ul style="list-style-type: none"> <li>High chemical stability</li> <li>Good mechanical and electric characteristics</li> <li>Higher temperature stability than Polyethylene</li> </ul>	Bumper covers, headlamp housings, wheel housing liners, battery housings, heater and A/C unit housing
Acrylonitrile butadiene styrene	ABS	<ul style="list-style-type: none"> <li>High stiffness, surface strength and sturdiness</li> <li>Possible metal coating and fiberglass addition</li> </ul>	Air ducts, wheel hub-caps, sun visors, exterior mirror housings

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Designation	Abbreviation	Properties	Areas of application
Polyamide	PA	<ul style="list-style-type: none"> <li>◆ High resilience against material fatigue</li> <li>◆ High impact and abrasion resistance</li> <li>◆ Good mechanical characteristics</li> <li>◆ Possible fiberglass strengthening</li> </ul>	Air ducts, wheel hub-caps, exterior mirror housings
Polycarbonate	PC	<ul style="list-style-type: none"> <li>◆ High stiffness, sturdiness and impact resistance</li> <li>◆ Transparent in its original condition</li> </ul>	Bumper covers, spoilers, air ducts, headlamps
PP- and PE-Copolymer	P/E	<ul style="list-style-type: none"> <li>◆ The added ethyl means significantly higher impact resistance than with pure polypropylene</li> </ul>	Bumper Cover
Acrylic ester-styrene-acrylonitrile	ASA	<ul style="list-style-type: none"> <li>◆ High strength and surface strength</li> </ul> <p>Conditions</p> <ul style="list-style-type: none"> <li>• Acrylic ester-styrene-acrylonitrile must not be welded.</li> </ul>	Air ducts, exterior mirror housings

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## Duroplastics

Duroplastics are brittle and viscoplastic plastics which do not soften or melt when heated. After reaching the decomposition temperature, duroplastics will decompose and carbonize, without changing their shape.

If duroplastics are exposed to high external forces, they will break immediately without deforming, due to their higher stiffness.

Duroplastics have a high chemical resistance. Because of this, they hardly swell and will not dissolve in solvent.

#### Condition

- Due to their characteristics, duroplastics may only be bonded for repairs

Characteristics and areas of application:

Designation	Abbreviation	Properties	Areas of application
Epoxy resin	EP	<ul style="list-style-type: none"> <li>◆ Excellent bonding strength on plastics</li> <li>◆ Addition of strengtheners possible</li> </ul>	Adhesives for plastic repairs
Unsaturated polyester resin. Refer to <sup>2)</sup> .	UP	<ul style="list-style-type: none"> <li>◆ Excellent mechanical characteristics</li> <li>◆ High chemical resistance</li> <li>◆ Often reinforced with fiberglass</li> </ul>	Bumper cover, grille, flaps, external body parts of commercial vehicles

#### Elastomers

Elastomers are characterized by high elasticity and a wide temperature range

Elastomers will change shape when pressure is applied externally. If pressure is released, elastomers will retain their original shape. If elastomers are heated, they will get soft, but they will not melt. If the decomposition temperature is exceeded, elastomers will decompose or carbonize.

#### Condition

- Due to their characteristics, elastomers may only be bonded for repairs

Polyurethane and Ethylene Propylene Diene rubber are the elastomers most often used in the automotive industry.

#### Polyurethane:

Polyurethane (PUR or PU) can be characterized by different chain structures depending on the manufacturing process. They can be thermoplastics, duroplastics or elastomers.  
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Elastomers can be manufactured in the form of foam and are suitable for reinforcements within bumper covers, instrument panels or steering wheels.

#### Ethylene Propylene Diene rubber:

Ethylene Propylene Diene rubber (EPDM) is often used in connection with propylene or polypropylene copolymer and polythy-

Irene during the manufacturing of bumper covers, to achieve high elasticity and impact resistance.

- 1) Not assigned
- 2) Unsaturated polyester resin, most often reinforced with fiberglass, has little use in the automotive industry.

## 9.3 Processing Guidelines - Original Products

- ⇒ [“9.3.1 Processing Times, Terminology”, page 32](#)
- ⇒ [“9.3.2 Two-Part Plastic-Adhesive -D 180 KU1 A1-”, page 32](#)
- ⇒ [“9.3.3 Plastic Bonding Agent -D 822 150 A1-”, page 33](#)
- ⇒ [“9.3.4 Plastic Cleaner -D 195 850 A1-”, page 33](#)
- ⇒ [“9.3.5 Adhesive -AMV 195 KD1 01-”, page 33](#)

### 9.3.1 Processing Times, Terminology

#### Exposure time

The time range needed for the product to dissolve the surface structure.

#### Duration of action

The time range in which the surface stays dissolved and the applied original product can bond to the component.

#### Flash-off time

The time range needed for contained solvents to evaporate.

#### Processing time/pot life

The time range in which the product must be processed, before it starts to harden. Within this time range the original product must be applied and the component, for example the glass, must be connected. Other joining processes (for example rivets or bolts) in the area of the adhesive must also be performed within this time frame.

#### Minimum Curing Time

The time range needed for the original product to change from a liquid into a solid state.

The minimum curing time can change depending on the temperature and indoor humidity.

#### Condition

- During the curing time no other procedures are allowed to be performed on the vehicle.

The vehicle is operationally ready only after the minimum curing time has elapsed.

#### Operational stability

The operational stability is reached after the minimum curing time elapsed.

### 9.3.2 Two-Part Plastic-Adhesive -D 180 KU1 A1-

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#### Processing temperature

The plastic adhesive must be processed at temperatures of 15 to 30 °C (59 to 86 °F).

### Curing Time

The processing time at a temperature of 23 °C (73.4 °F) is approximately 10 min at 50 % relative indoor humidity.

### Minimum Curing Time

#### Condition

- The plastic adhesive must harden for approximately 5h at a temperature of 23 °C (73.4 °F)

By using an infrared lamp, the hardening time can be reduced to 15 min at temperatures of 60 to 70 °C (140 to 158 °F).

#### Condition

- The distance from the plastic component to the infrared lamp must be 70 to 80 cm.

### Cleaning

Fresh plastic adhesive which is not hardened yet, can be removed dry or be removed using solvent. Hardened plastic adhesive can only be removed by mechanical means.

## 9.3.3 Plastic Bonding Agent -D 822 150 A1-

### Processing temperature

The bonding agent must be processed at temperatures of 15 to 30 °C (59 to 86 °F).

### Exposure time

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### Duration of action

The duration of action of the bonding agent is 24 h.

#### Condition

- If the duration of action of the bonding agent has elapsed before adhesive was applied, then the bonding agent must be applied again.

## 9.3.4 Plastic Cleaner -D 195 850 A1-

### Flash-off time

The flash-off time of the plastic cleaner is 5 min.

## 9.3.5 Adhesive -AMV 195 KD1 01-

### Flash-off time

The flash-off time of the adhesive is 3 min.

### Processing temperature

The adhesive must be processed at temperatures of 60 to 80 °C (140 to 176 °F).

## 9.4 Plastic Repairs, Preparing

### Special tools and workshop equipment required

- ◆ Drill
- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-

The Plastic Cleaner D 195 850 A1 will be called cleaner in the information that follows.

The Plastic Adhesive AMV 195 KD1 01 will be called adhesive in the information that follows.

---

- Remove the plastic attachment.

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- Determine plastic types. Refer to ⇒ Rep. Gr. 52 ; Distinction of Plastic Types .

- Determine if a plastic repair is economically, aesthetically and technically feasible.

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#### Condition

- "Safety-related" plastic attachments, for example bumper covers, must not be repaired if their function is not ensured after servicing.

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- Remove dust, clay or grease residues from the component with water and soap.

---

- Insert a suitable welding nozzle in the Hot Air Blower - V.A.G 1416- .

#### Condition

- The Hot Air Blower must be adjusted to the plastic and the welding nozzle used.
- Adjust the temperature of the Hot Air Blower according to the table.

The temperature to be used during plastic repairs depends on the plastic type to be serviced.

Thermo-plastics abbreviation	Welding temperature	Control settings at the potentiometer		
		Adapter nozzles for welding procedures	Quick welding nozzle, 5 mm	Welding nozzle, wedge-shaped
PA	400 °C (752 °F)	4.3	4.8	4.3
PC+ABS	350 °C (662 °F)	3.6	4.1	3.6
ABS	350 °C (662 °F)	3.6	4.1	3.6
PC	350 °C (662 °F)	3.6	4.1	3.6
P/E	300 °C (572 °F)	3.0	3.5	3.0
PP	300 °C (572 °F)	3.0	3.5	3.0
PP+EPDM	300 °C (572 °F)	3.0	3.5	3.0
PE	280 °C (536 °F)	2.8	3.3	2.8

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- Wait until the set welding temperature has been reached.

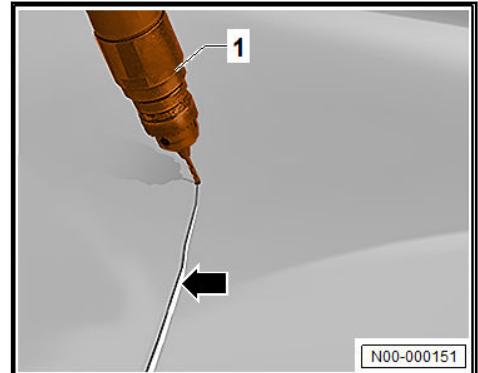
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#### If the plastic attachment has a tear:

- Drill open the end of the tear using a drill -1-, using a low speed.

##### Tip

Tensions within the material are reduced and an extension of the tear -arrow- will be avoided.



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- Clean the edges of the tear using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Apply the adhesive on one side of the tear. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .
- Merge the edges of the tear.

## 9.5 Distortion, Servicing

### Special tools and workshop equipment required

- ◆ Indentation tool
- ◆ Orbital Sander
- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-
- ◆ Pump Spray Bottle
- ◆ Sandpaper P150

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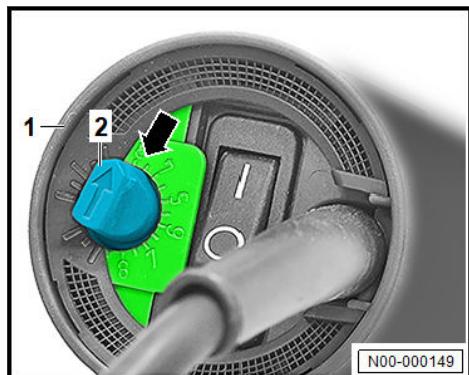
- Refer to ⇒ Rep. Gr. 52 ; Plastic Repairs, Preparing .

---

- Set the Hot Air Blower - V.A.G 1416- -1- to 200 °C (392 °F), for this, turn the controller -2- to position 3.3 of the scale -arrow-.

#### Condition

- The Hot Air Blower -1- must be used without nozzle



- Heat up the repair area using the Hot Air Blower -A-, until it is workable.
- Move the Hot Air Blower -A- in circular motion.

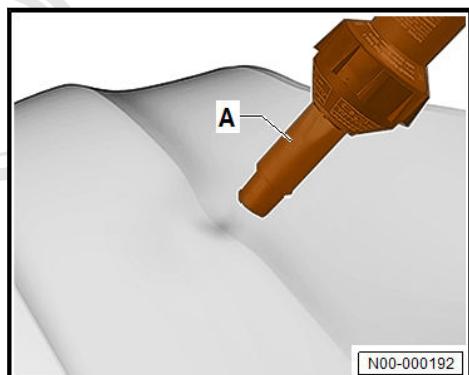
#### Condition

- The plastic attachment must not melt
- To avoid markings or deformations, heat up the back of the repair area.8

#### Condition

- Both sides of the repair area must be evenly heated with circular motion.

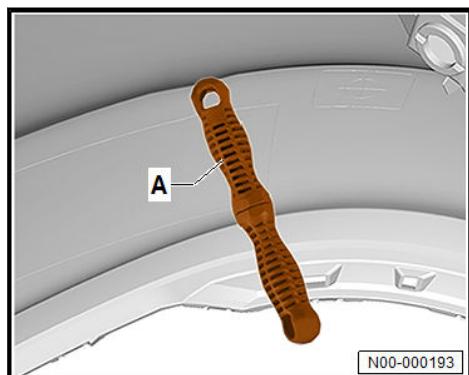
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- Press an Indentation Tool -A- in the opposite direction to the distortion, until the original form of the plastic attachment is restored.

#### Condition

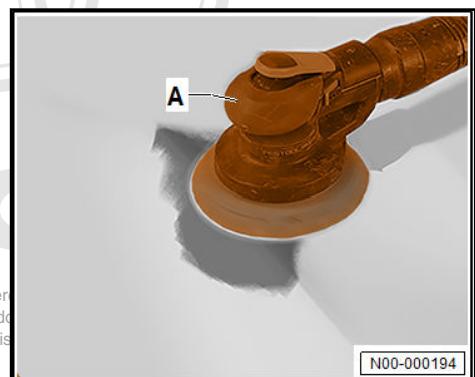
- An Indentation Tool -A- must be used, which is made of temperature resistant material.
- Massage the plastic attachment using an Indentation Tool .
- To cool down the repair area, apply water to the surface, by using a Pump Spray Bottle or placing a wet cleaning cloth.
- Keep pressure on the distorted area, until the material cools down.
- Repeat heating up and applying pressure until the original shape of the plastic attachment has been restored.



#### If the plastic attachment shows some unevenness.

- Clean the plastic attachment using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using an Orbital Sander -A- and Sandpaper P150 .
- Blow out the sanding residue.
- Clean the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

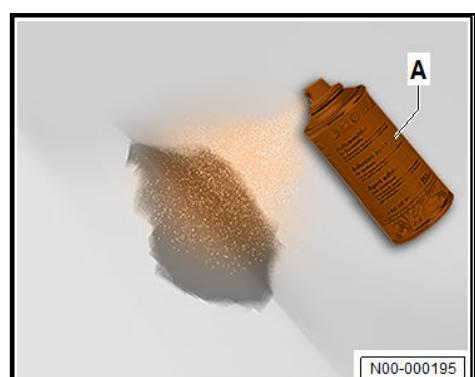


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N00-000194

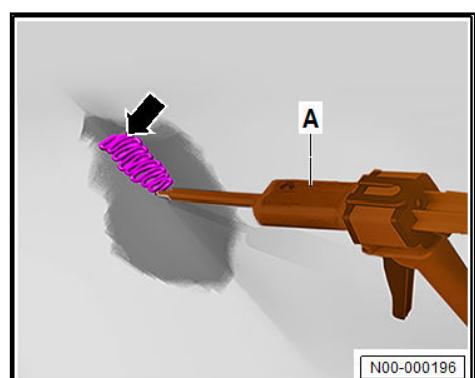
### Continuation

- Apply bonding agent -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



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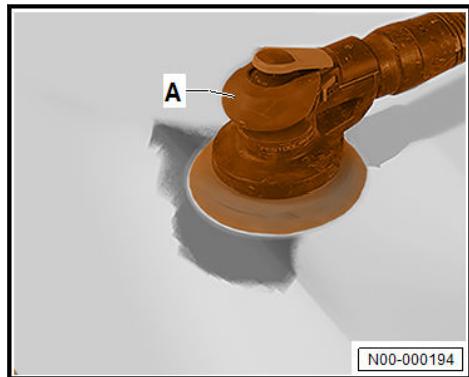
- Apply a 2 cm adhesive bead -arrow- onto a test piece.
- Make sure that both components of the adhesive -A- are mixed entirely.
- Apply adhesive -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



N00-000196

- Clean the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using an Orbital Sander -A- and Sandpaper P150 .
- Blow out the sanding residue.
- Clean the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



## 9.6 Plastic Attachments, Bonding

⇒ “9.6.1 Tears up to Lengths of 100 mm, Bonding”, page 38

⇒ “9.6.2 Scratches, Bonding”, page 41

⇒ “9.6.3 Hole up to 30 mm, Bonding”, page 43

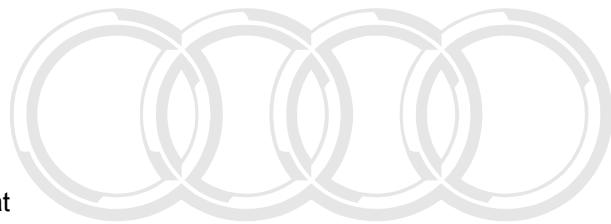
### 9.6.1 Tears up to Lengths of 100 mm, Bonding

Special tools and workshop equipment required

- ◆ Orbital Sander
- ◆ Sandpaper P120
- ◆ Sandpaper P150
- ◆ Sandpaper P80
- ◆ Scraper

Plastic cleaner will be called cleaner in the information that follows.

Plastic adhesive will be called adhesive in the information that follows.



- Refer to ⇒ Rep. Gr. 52 ; Distortion, Servicing .

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Condition

- Both sides of the tear must face each other without tension.

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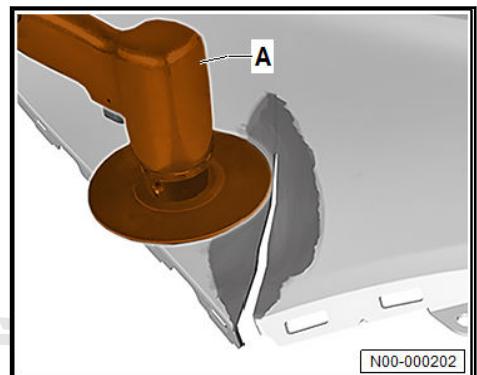
- Clean the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

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- Sand the repair area using an orbital sander -A- and sandpaper P80 .

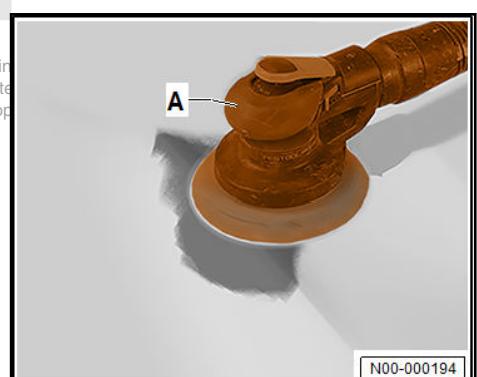
**Tip**

The size of the surface to be enlarged depends on the size and material thickness of the body attachment.

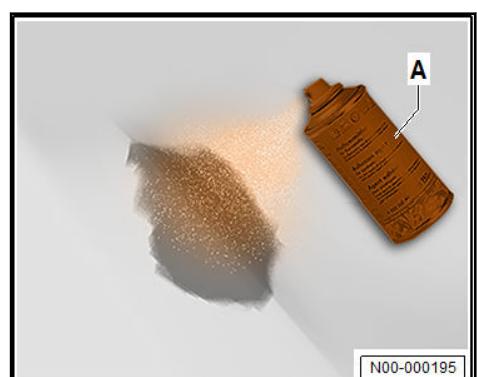


- Clean the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using an orbital sander -A- and sandpaper P120 .  
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- Blow out the sanding residue
- Clean the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



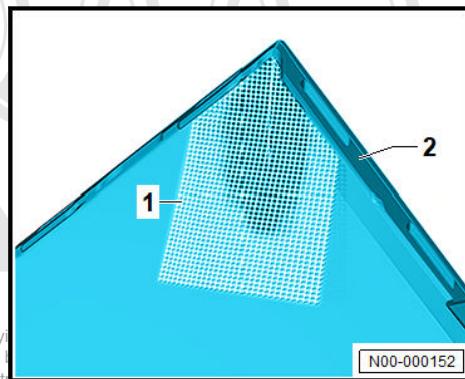
- Apply bonding agent -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



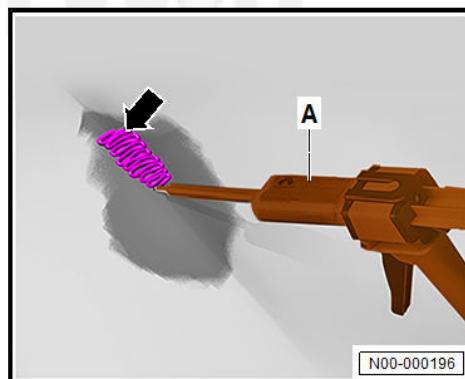
- Measure and adjust fabric -1-.

Condition

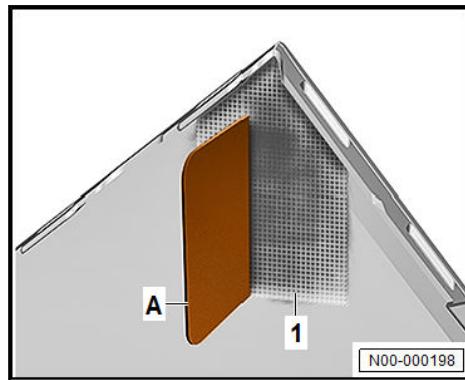
- The fabric -1- must overlap the tear in the body attachment  
-2- extensively.



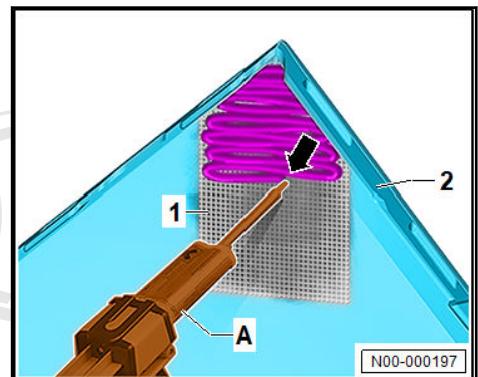
- Apply a 2 cm adhesive bead -arrow- onto a test piece.
- Make sure that both components of the adhesive -A- are mixed entirely.
- Apply adhesive -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



- Position the fabric -1-, press it on using a scraper -A- and spread the applied adhesive.

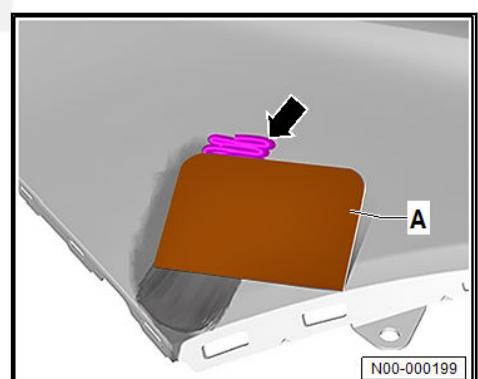


- Apply adhesive -A- onto the fabric -1-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .
- Spread the adhesive bead -arrow- with a scraper .

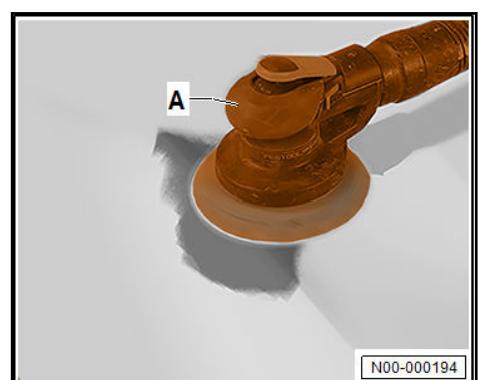


- Clean the outside areas of the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Apply adhesive and spread the adhesive bead -arrow- using a scraper -A-.



- Sand the repair area using an Orbital Sander -A- and Sandpaper P150 .
- Blow out the sanding residue.
- Clean the repair area using cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



## 9.6.2 Scratches, Bonding

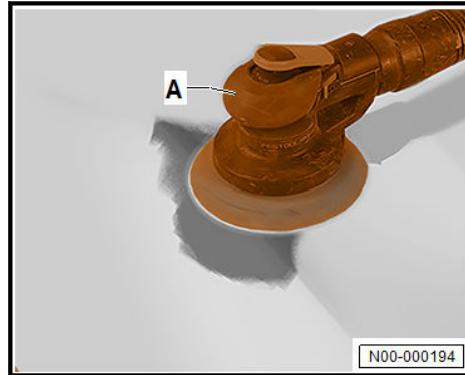
If plastic attachments are distorted:

- Refer to ⇒ Rep. Gr. 52 ; Distortion, Servicing .

## Continuation

- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using an orbital sander -A- and P120 sandpaper.
- Blow out the sanding residue.
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

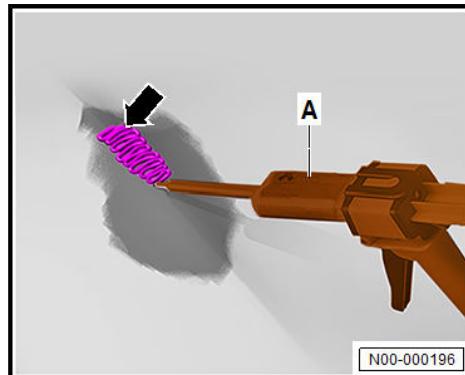


- Apply bonding agent -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



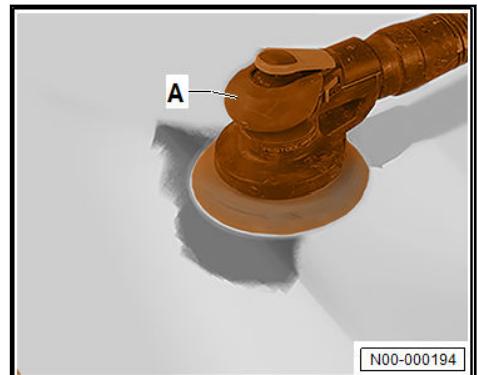
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- Apply a 2 cm adhesive bead -arrow- onto a test piece.
- Make sure that both components of the plastic adhesive -A- are mixed entirely.
- Apply plastic adhesive -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .
- Spread the adhesive bead -arrow- with a commercially available scraper.



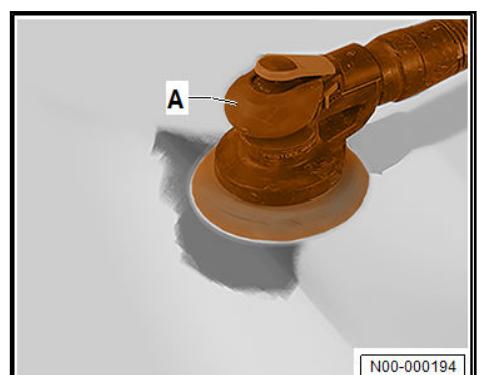
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using an orbital sander -A- and P150 sandpaper.
- Blow out the sanding residue.
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

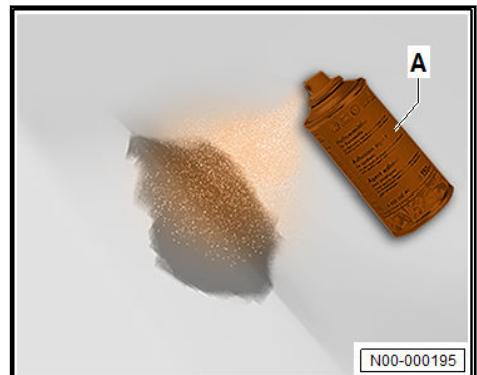


### 9.6.3 Hole up to 30 mm, Bonding

- Refer to ⇒ Rep. Gr. 52 ; Plastic Repairs, Preparing .
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .
- Sand the repair area using an orbital sander -A- and P120 sandpaper.
- Blow out the sanding residue.
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

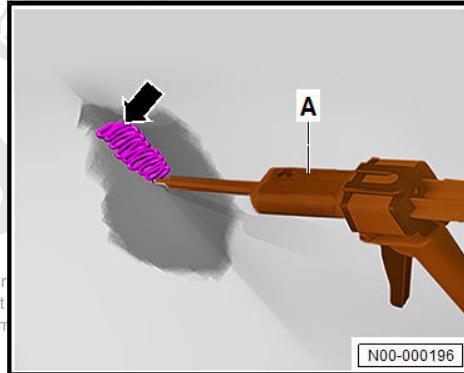


- Apply bonding agent -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



- Apply a 2 cm adhesive bead -arrow- onto a test piece.
- Make sure that both components of the plastic adhesive have mixed entirely.
- Apply plastic adhesive. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .
- Spread the adhesive bead -arrow- with a commercially available scraper.

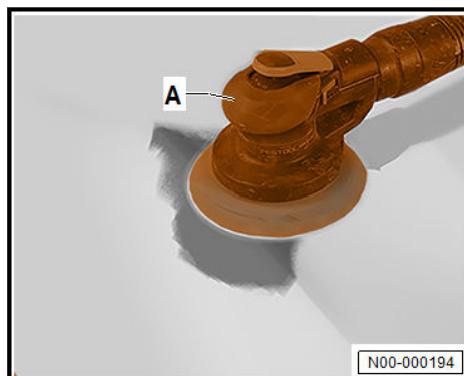
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N00-000196

- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using a commercially available orbital sander -A- and P150 sandpaper.
- Blow out the sanding residue.
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



N00-000194

## 9.7 Plastic Attachments, Welding

⇒ “9.7.1 Tears up to Lengths of 100 mm, Welding”, page 44

⇒ “9.7.2 Tab, Welding”, page 49

### 9.7.1 Tears up to Lengths of 100 mm, Welding

- Refer to ⇒ Rep. Gr. 52 ; Distortion, Servicing .

#### Condition

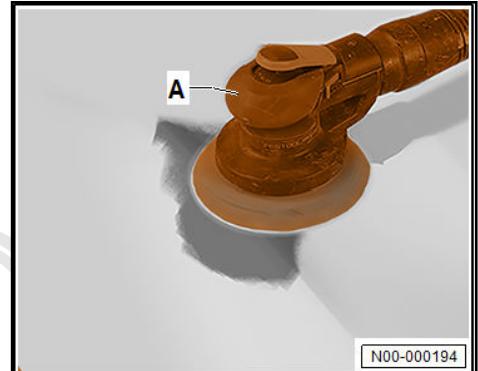
- Both sides of the tear must face each other without tension.

- Refer to ⇒ Rep. Gr. 52 ; Plastic Repairs, Preparing .

- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

#### **Painted plastic attachments:**

- Sand the repair area using a commercially available orbital sander -A- and P120 sandpaper.
- Blow out the sanding residue.



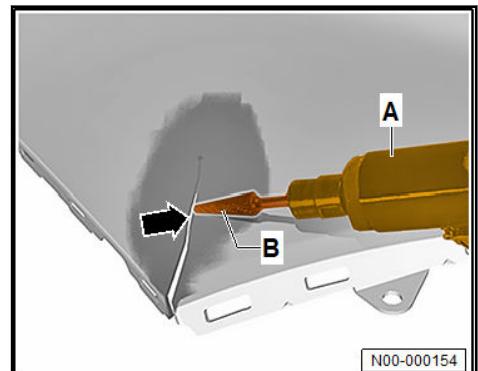
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

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#### **Continuation for all vehicles**

##### **If the plastic attachment is not too thin:**

- Mill a v-shaped chamfer on the inside and the outside, along the tear -arrow- using a commercially available conical milling machine -B-.
- Blow out milling residues.
- Align the tear -arrow- flush.



## Continuation

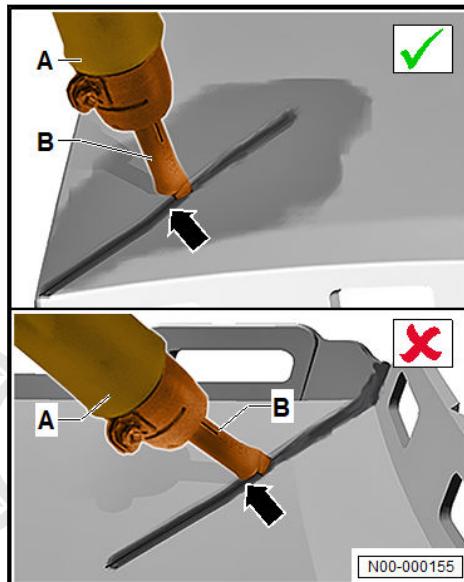
- Insert a wedge-shaped welding nozzle -B- into the Hot Air Blower -A-.
- Puncture the plastic attachment along the tear -arrow- using the wedge-shaped welding nozzle -B- at welding temperature.

### Condition

- The contact line of the wedge-shaped welding nozzle -B- must be moving parallel to the surface.
- If the contact line of the wedge-shaped welding nozzle -B- is not parallel to the surface, then material is removed.

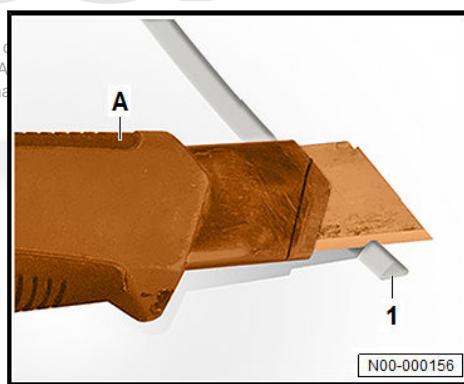
### Tip

The first weld is performed without adding material, to establish a connection between the edges of the tear. This connection is the base for adding material.




---

- Create a chamfer at the end of the welding rod -1- using a commercially available knife -A-. Protected by copyright. Copying for private use is permitted unless authorised by AUDI AG. All rights reserved. Responsibility for the correctness of information lies with the user.
- Make sure the welding rod -1- is clean and without flaws.

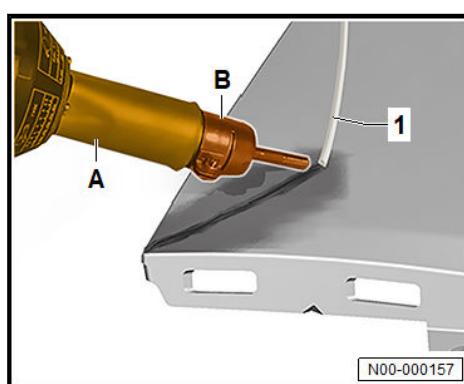



---

- Insert the adapter nozzle -B- into the Hot Air Blower -A-.
- Position the welding rod -1- with the wedged side at the end of the tear.
- Move the Hot Air Blower -A- in a wagging motion.
- Heat up the welding rod -1- and the body attachment using the Hot Air Blower -A-, until the welding rod -1- and the body attachment soften at the same time.
- Press the welding rod -1- into the tear area, to add material.

### Condition

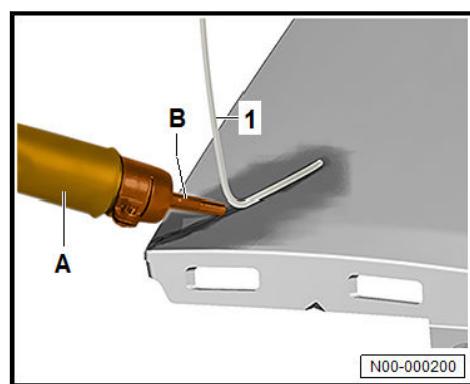
- Pressure on the welding rod -1- must be great enough that the welding rod -1- can connect to the body attachment. At the same time the welding rod -1- must not deform itself or break the v-shaped chamfer.



- Guide the welding rod -1- vertically, moving in direction of the tear.

#### Condition

- The welding rod -1- must be kept at an angle of 80 to 90° to the surface.
- Move the Hot Air Blower -A- along the tear.
- Choose the welding speed in a way that:
  - ◆ No material decomposes or distorts.
  - ◆ The welding rod -1- does not connect to the body attachment.



#### Once the tear is welded:

- Let the body attachment cool down.
- Cut the excess welding rod.

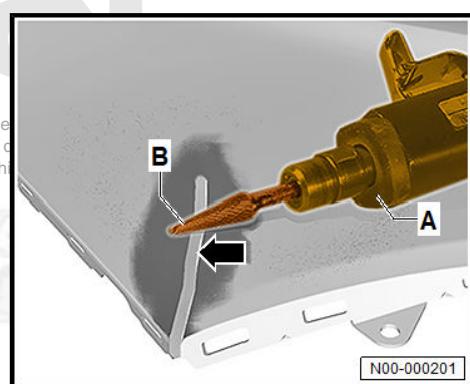
#### Continuation

- Repeat the process for the other side of the body attachment.

- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

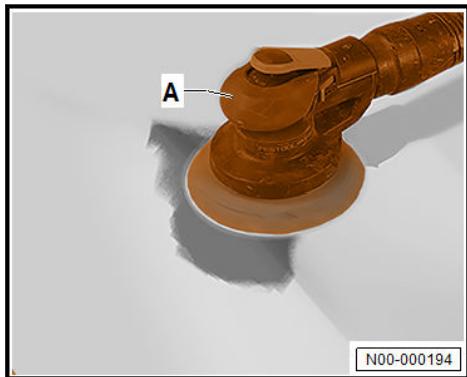
- Remove exceeding material of the weld seam -arrow- using a commercially available conical milling machine -B-.
- Blow out the sanding residue.

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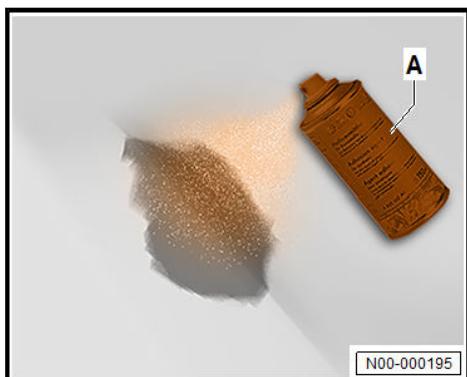
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using a commercially available orbital sander -A- and P120 sandpaper.
- Blow out the sanding residue.
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

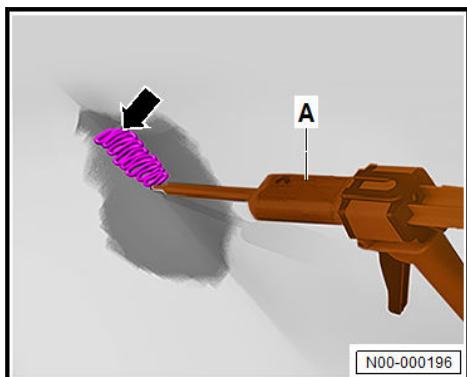


- Apply bonding agent -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

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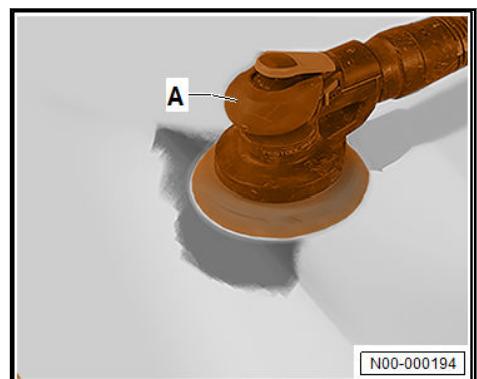


- Apply a 2 cm adhesive bead -arrow- onto a test piece.
- Make sure that both components of the plastic adhesive -A- have mixed.
- Apply plastic adhesive -A-. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .
- Spread the adhesive bead -arrow- with a commercially available scraper.



- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Sand the repair area using a commercially available orbital sander -A- and P150 sandpaper.
- Blow out the sanding residue.
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

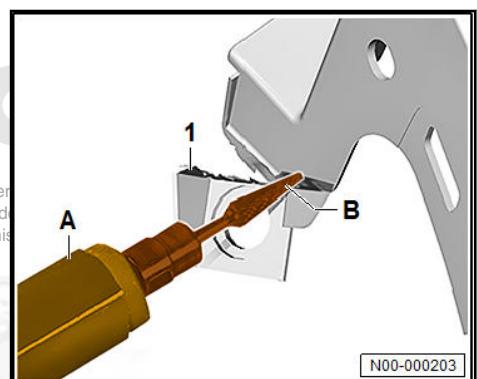


### 9.7.2 Tab, Welding

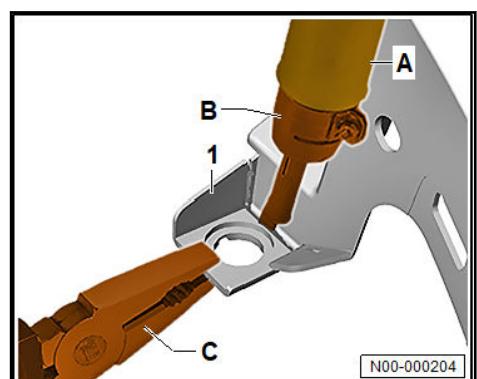
- Refer to ⇒ Rep. Gr. 52 ; Plastic Repairs, Preparing .

- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .

- Mill a v-shaped chamfer along the outside and inside length of the tear -1- using a commercially available conical milling machine -B-.
- Blow out milling residues.
- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



- Insert a wedge-shaped welding nozzle -B- into the Hot Air Blower -A-.
- Align the tab -1- so it is flush.



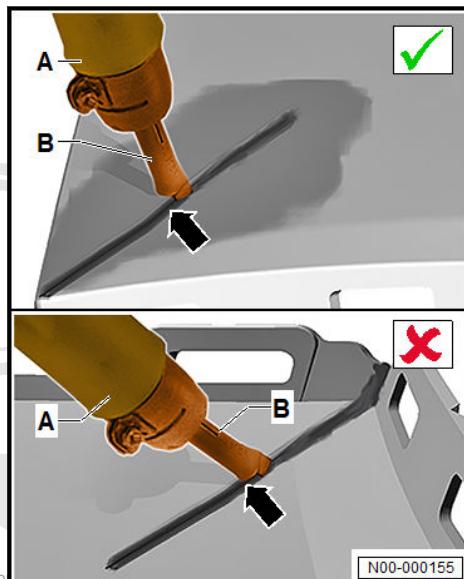
- Punctuate the tab in its entire length using a wedge-shaped welding nozzle -B- and the Hot Air Blower -A- at welding temperature.

#### Condition

- The contact line of the wedge-shaped welding nozzle -B- must be moving parallel to the surface.
- If the contact line of the wedge-shaped welding nozzle -B- is not be parallel to the surface, then material is removed.

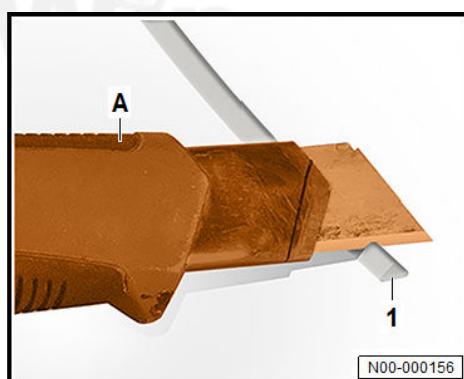
#### Tip

The first weld is performed without adding material, to establish a connection between the edges. This connection is the base for adding material.



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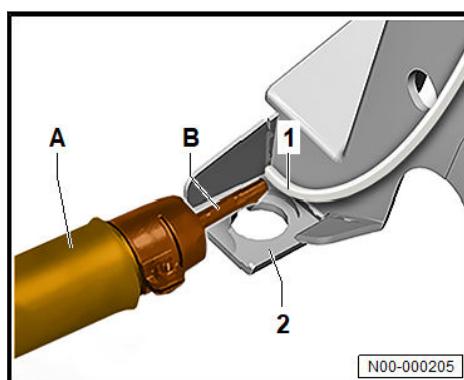
- Create a chamfer at the end of the welding rod -1- using a commercially available knife -A-.
- Make sure the welding rod -1- is clean and without flaws.



- Insert the adapter nozzle -B- into the Hot Air Blower -A-.
- Position the welding rod -1- with the wedged side.
- Move the Hot Air Blower -A- in a wagging motion.
- Heat up the welding rod -1- and the tab -2- using the Hot Air Blower -A-, until the welding rod -1- and the tab -2- soften at the same time.
- Press the welding rod -1- into the tear area, to add material.

#### Condition

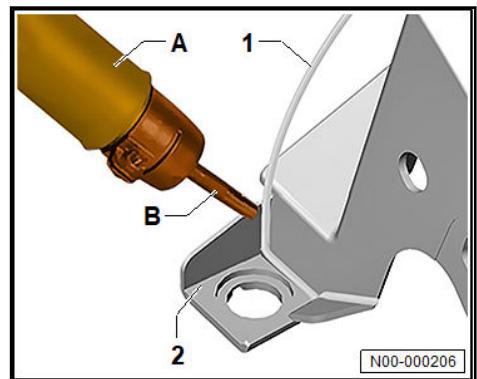
- Pressure on the welding rod -1- must be great enough that the welding rod -1- can connect to the body attachment. At the same time the welding rod -1- must not deform itself or break the v-shaped chamfer.



- Guide the welding rod -1- vertically, moving in direction of the tear.

**Condition**

- The welding rod -1- must be kept at an angle of 80 to 90° to the surface.
- Move the Hot Air Blower -A- along the tear.
- Choose the welding speed in a way that:
  - ◆ No material decomposes or distorts.
  - ◆ The welding rod -1- does not connect to the body attachment.

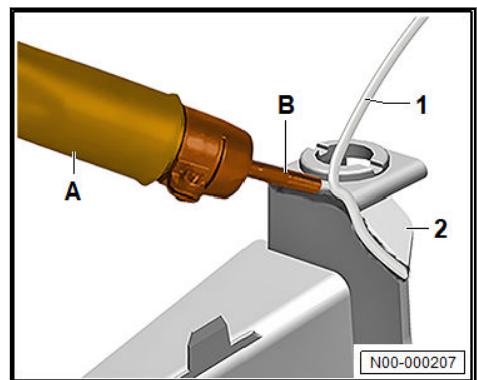


**Once the tear is completely welded:**

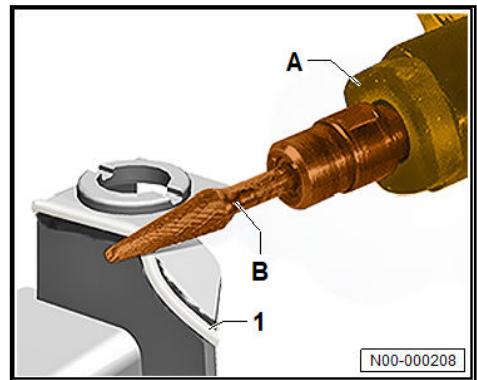
- Let the body attachment cool down.
- Cut the excess welding rod.

**Continuation**  
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**Repeat the process for the other side of the body attachment.**



- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .
- Remove exceeding material of the weld seam -1- using a commercially available conical milling machine -B-.
- Blow out the sanding residue.



- Clean the repair area using plastic cleaner. Refer to ⇒ Rep. Gr. 52 ; Processing Guidelines - Original Products .



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## 10 Windows, General Information

⇒ "10.1 Damaged Window Glass, Removing", page 53

⇒ "10.2 Windows, Servicing", page 53

### 10.1 Damaged Window Glass, Removing

Special tools and workshop equipment required

- ◆ Window Cutter - V.A.G 1561B-
- ◆ Window Cutter - U Blade (2 pc.) - V.A.G 1561/3-



#### CAUTION

Risk of injury to the hands and eyes from glass fragments.

Getting cut is possible.

- Wear protective eyewear.
- Wear safety gloves.



#### NOTICE

Risk of damaging component surfaces.

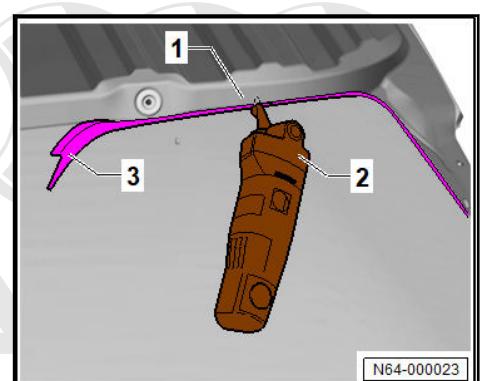
- Tape off the surrounding components in the visible area using commercially available adhesive tape.

- Protect the body and vehicle interior from glass splinters.

- Remove the glass pieces up to the adhesive residue.

- Disconnect the connectors.

- Tape off all around the body flange -1- using fabric-reinforced adhesive tape.
- Cut through the adhesive residue (with the remaining glass) -3- in the window opening using the Window Cutter - V.A.G 1561A- -2- and the Window Cutter (U Blade) - V.A.G 1561/3- .



### 10.2 Windows, Servicing

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Damaged window glass can be serviced using the Windscreen Repair Set - VAS 6092A- or the Window Glass Polishing Set - VAS 861 009- .

An instruction manual is included in every window glass repair set and window glass polishing set.



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## 11 Glass Repair

⇒ "11.1 Introduction", page 55

⇒ "11.2 Glass Repairs, Preparing", page 58

⇒ "11.3 Glass Repairs, Performing", page 59

### 11.1 Introduction

#### General Information

Laminated glass screens are composed of two glass panels which are connected by a transparent plastic film. During manufacturing of laminated glass screens, less tension is being built up, resulting in less smaller fragments if damages occur and a better view is guaranteed even if the glass is damaged.

Glass repairs have the following advantages compared to replacements:

- ◆ Cheaper solution
- ◆ Time saving procedure
- ◆ Less environmental impact
- ◆ Entry of air or water, corrosion, and poor signal for vehicles with windshield antenna can be avoided.

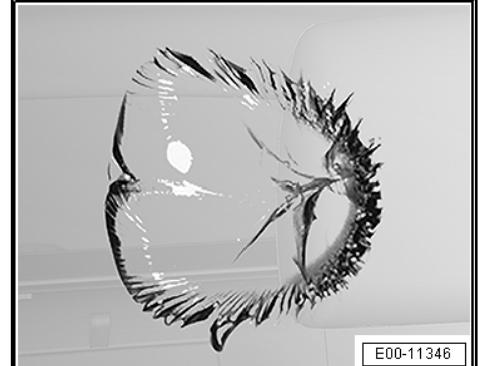
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Tinted, heated or vapor deposited glass screens, windshields with sun shade area and heat-reflecting glass can be repaired. The tint of the plastic film remains.

#### Damage types

Damage types of laminated glass screens that can be repaired while paying attention to the following conditions:

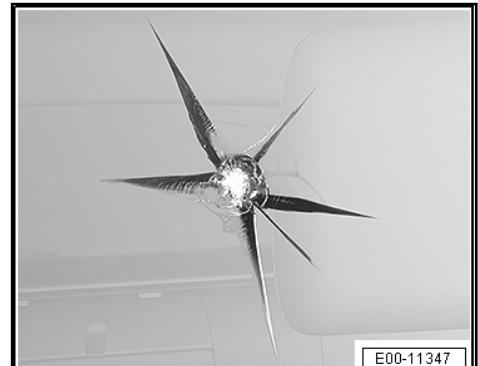
##### Bull's eyes (stone impact)



##### Star break (stone impact)

###### Condition

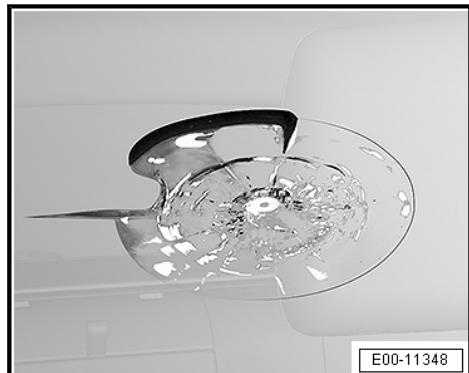
- Cracks coming from the impact site may not be longer than 50 mm.
- Cracks may not end in the window seal rubber.



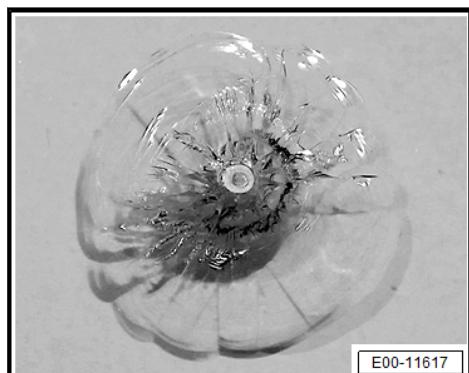
### Combination crack (stone impact)

Condition

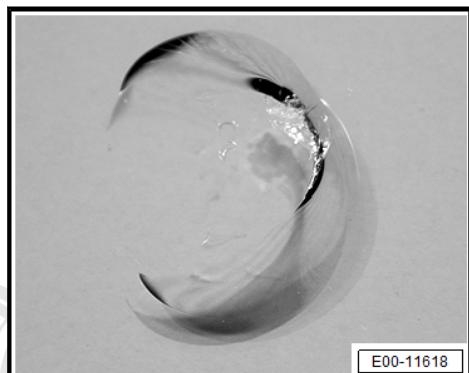
- Cracks coming from the impact site may not be longer than 50 mm.
- Cracks may not end in the window seal rubber.



### Daisy crack (stone impact)



### Half moon (stone impact)



### Crack (scratch)

Condition

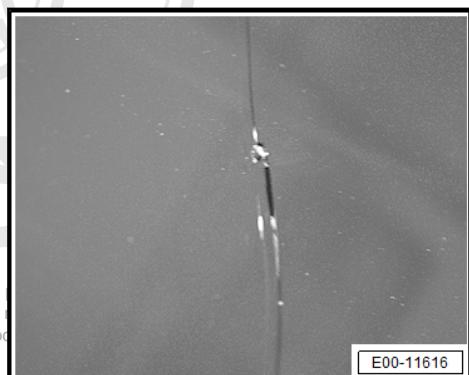
Requirement for servicing:

- No contamination or humidity must have entered the inner area of the crack.
- Cracks with impact site can be serviced.

Cracks without impact site might have resulted due to inner  
tensions of the material.

### Requirements

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### Impact site

a - Ceramic Coating

A - Repair Area

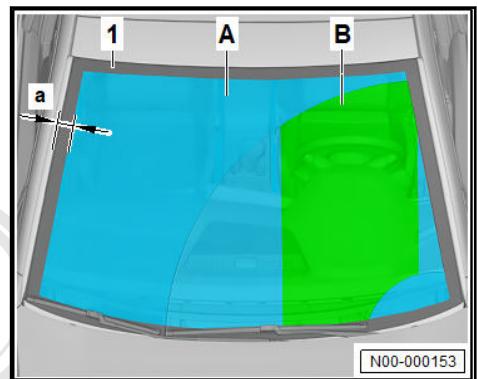
B - Field of Vision

1 - Windows

#### Condition

- Glass -1- can be repaired, if damage to the outside and inside is not at the same location.
- The impact site must be within the repair area -A-.

The field of vision -B- correspond to a line centered to the steering wheel center point, which is limited at the top and bottom by the windshield wiper area.



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## Dimension

### Condition

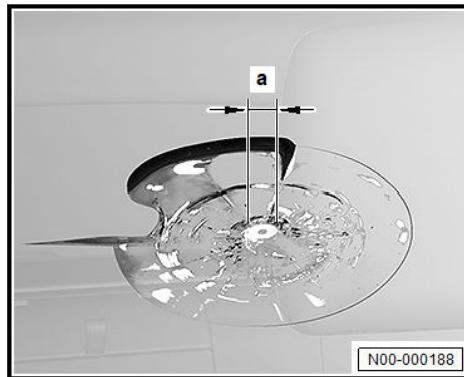
- The diameter -a- of the impact site must be less than or equal 5 mm.

If the impact site is greater, then vacuum or pressure cycles cannot be performed properly.

The greater the impact site, the greater the optical marks after the repair can be.

### Condition

- The inner area of the repair site must be tested for vision.
- Customers must be informed of negative effects of the glass repair. If a glass repair is not possible, customers must be informed of the reasons for this.



## Contamination:

### Condition

- If present contaminations are not removed, then these contaminations can still be visible after the glass repair.

## Moisture:

### Condition

- To determine moisture in the inside area, the damage must be inspected from all possible angles.
- If a dark area changes into a brighter area if the angle of view is changed, then moisture may be on the inside of the damage.
- A glass repair may only be performed if the moisture has been removed.



## Discoloration:

### Condition

- Liquids, such as windshield washer fluid concentrate or acid rain may react with the plastic film in the repair area, resulting in creating a shadow effect (mostly blue). Shadows may be visible after the repair.

## Delamination:

Delamination describes the separation of the glass from the plastic foil, due to the impact.

Delamination is characterized by very bright spots in the damage area.

### Condition

- Only damage which did not impair the inner plastic film may be repaired.

If the foil compresses or deforms during the repair, then dark spots will be visible after the repair.

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## 11.2 Glass Repairs, Preparing

### Special tools and workshop equipment required

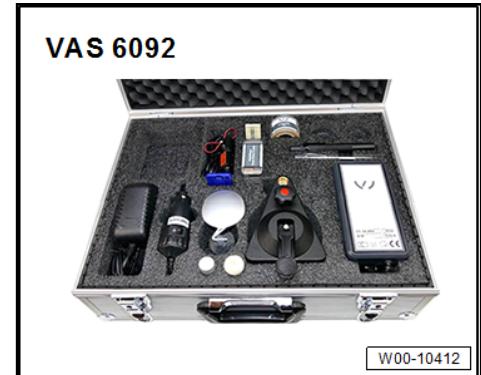
- Windscreen Repair Set - VAS 6092-

## Evaluation

- Determine if a plastic repair is economically, aesthetically and technically feasible. Refer to ⇒ Rep. Gr. 52 ; Introduction .

## Tool Preparation

- Make sure that the condition of the components of the Windscreen Repair Set - VAS 6092- is OK.



- Check the expiration dates on needed materials.

## Preparing the vehicle

### Condition

- The vehicle may not be exposed to any direct sunlight during the glass repair.
- The work area must be protected against moisture.

- Protect vehicle areas which might get damaged during the glass repair.

## 11.3 Glass Repairs, Performing

### Removing

- Clean the repair area using a dry cleaning cloth. At the same time protect the repair area from further contamination.

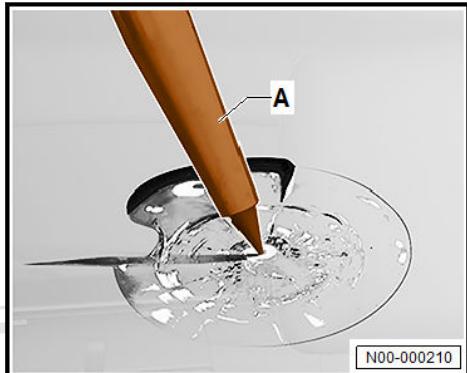
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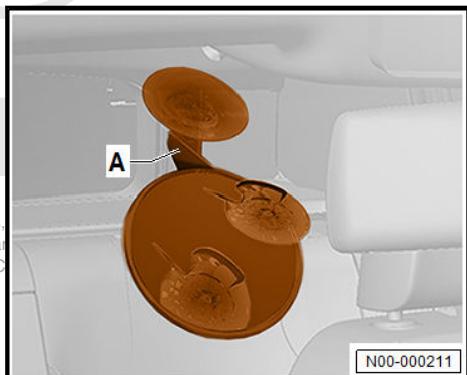
- Remove loose fragments or surface contamination from the repair area, using a hard-metal pin -A-.

**Condition**

- The diameter must not be enlarged.



- Coat the suction cap of the mirror -A- with gel.
- Position the mirror -A- at the interior, so that the repair area is visible.



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**If the impact site diameter is too small.**

**Tip**

If the impact site diameter is too small, no resin will be able to penetrate.

- Drill open the impact site using a commercially available drill and suitable spiral bit in 2 second intervals.

**Tip**

If short intervals are used, then overheating of the spiral bit can be avoided.

**Continuation**

- View the repair area from different angles.

**Condition**

- If a dark area changes to a brighter area during the check, then there is a high chance of moisture being present in the repair area.

#### If moisture is found in the repair area:

- Use the vacuum procedure, using a tool holder and an injector to extract the moisture.
- Slowly heat up the inner side of the repair area using a commercially available Hot Air Blower.

#### Tip

Heat will expand the repair area and moisture escapes.

- Let the repair area cool down.

---

#### If moisture cannot be removed:

- End the glass repair procedure.

#### Tip

Moisture in the repair area can lead to damage during the glass repair.

- Inform the customer.
- Replace the glass. Refer to ⇒ Body Exterior; Rep. Gr. 64 ; Windshield; Windshield, Removing and Installing .

---

#### Continuation

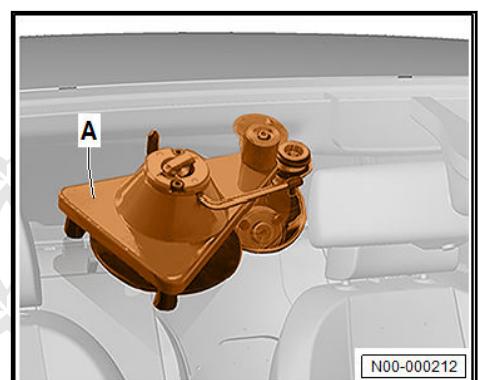
- Slowly heat up the inner side of the repair area using a commercially available Hot Air Blower.

#### Tip

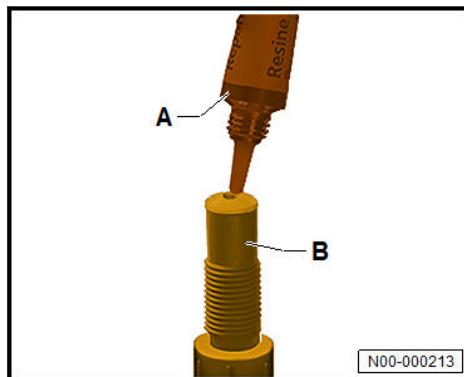
Sudden temperature changes can cause further damages in the repair area.

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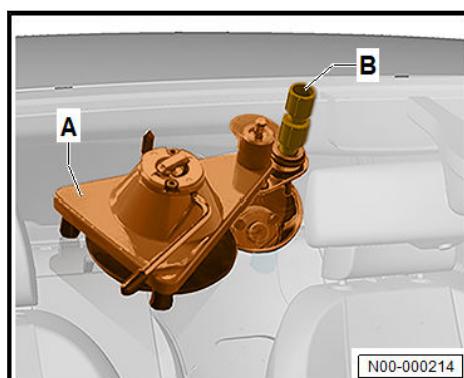
- Coat the suction cap of the tool holder -A- with gel.
- Position the tool holder -A- centered to the impact site and press the lever toward the rear.



- Open the packaging.
- Remove the injector -B- and the resin -A-.
- Loosen the piston of the injector -B- 4 to 5 mm.
- Fill the resin -A- into the injector -B-.
- To avoid the exposure to UV radiation, resin -A- that is not required should be stored in opaque packaging.



- Install the injector -B- into the tool holder -A-, until the injector -B- slightly comes into contact with the glass.
- Center the injector seal -B- on the repair area using the mirror and turn, until the area between glass and piston is sealed.



- Install the piston -B-, until the seal expands by dimension -a-.

#### Condition

- While the piston -B- is installed, counterhold on the cylinder.
- The position of the tool holder -A- must be kept.
- Let the resin penetrate for 5 minutes.

#### Tip

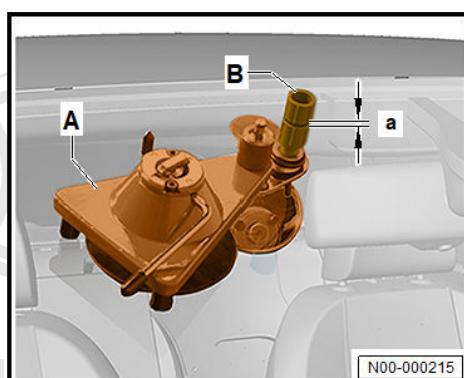
With bull's eye's type of damages, the resin will penetrate fast.

With closed off cracks, for example a star break, the resin needs more time to penetrate. To ease penetration of the crack with resin, the piston may be pressed slightly with closed off cracks.

#### Condition

Too much pressure on the repair area can:

- enlarge the damage
- form resin flowers between the glass panes and plastic film.



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**Vehicles without colored or isolated plastic film on the inside of the glass:**

**If air venting should be promoted during the pressure cycle:**

Condition

- The repair area must have cooled down before applying pressure.

**Tip**

Heat lets the repair area expand and make the resin become runnier.

- Slowly heat up the inner side of the repair area using a commercially available Hot Air Blower.

**Tip**

Sudden temperature changes can cause further damages in the repair area.

#### Continuation for all vehicles

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- Loosen the piston -B-, until distance -a- of the threads is reached and remain in this position for at least 5 min.

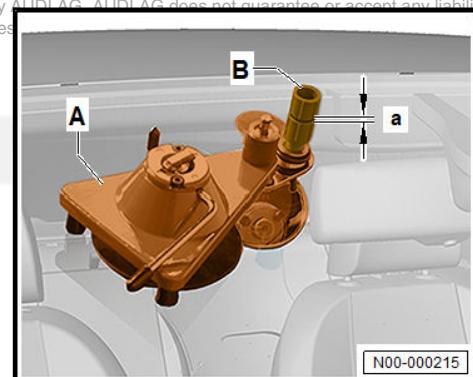
Distance -a- = 10 mm

Condition

- When the piston -B- is loosened, counterhold on the cylinder.

**Tip**

Air is extracted from inside the repair area. The air can be seen as small black dots in the mirror, which move toward the injector and disappear gradually.



- Make sure that the repair area is filled with resin.
- View the repair area from all angles. Use the mirror to do this.

Condition

- This check must be performed during the vacuum phase, because air could get compressed during the pressure phase and thus is not visible as black dots.

- Repeat the procedures until the repair area is filled with resin.

**Tip**

At least 2 pressure and vacuum cycles should be performed.

- To prevent the resin from retracting, perform a pressure cycle last.

- Cut the hardening film -A- to dimension.

Condition

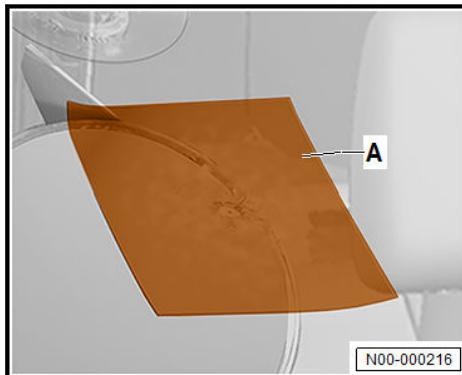
- The dimensions should be 4 to 5 cm.
- Pull up the tool holder lever and remove the tool holder suction cap slowly.

Condition

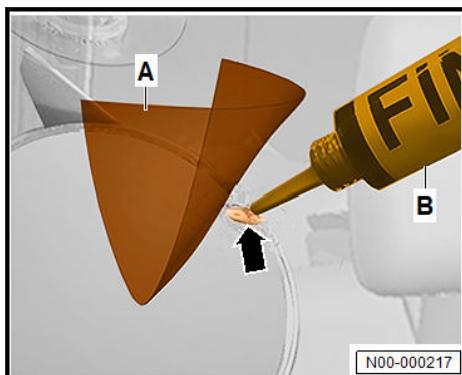
- All air must have been extracted from the repair area.
- Place the hardening film -A- over the repair area.

Condition

- So that no air enters, no pressure may be applied to the repair area.
- Remove excess resin around the hardening film -A-.



- Lift the hardening film -A- and apply a drop -arrow- of finishing resin -B- directly onto the repair area.
- Reapply the hardening film -A-.

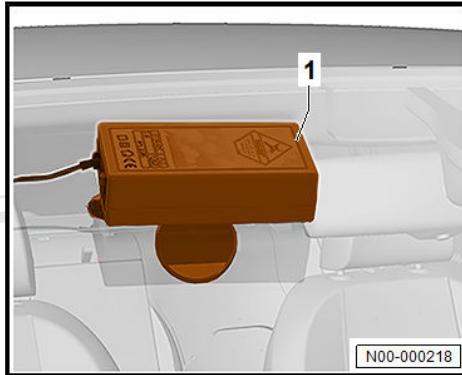


- Coat the suction caps of the UV lamp -1- with gel.
- Position the UV lamp -1- centered to the repair area.
- Switch on the UV lamp -1-.

#### Tip

The UV lamp -1- is equipped with a timer and will turn off automatically.

- Let the resin harden for 5 to 6 min.

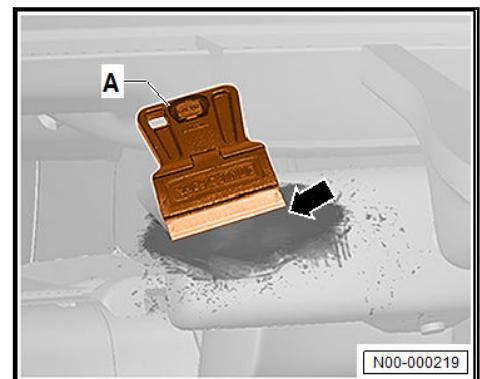


- Remove the mirror.

- Remove the UV lamp and the hardening film.

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- Scrape off excess resin -arrow- using a commercially available cutting knife -A- vertically to the glass.



#### If resin is missing at the impact location:

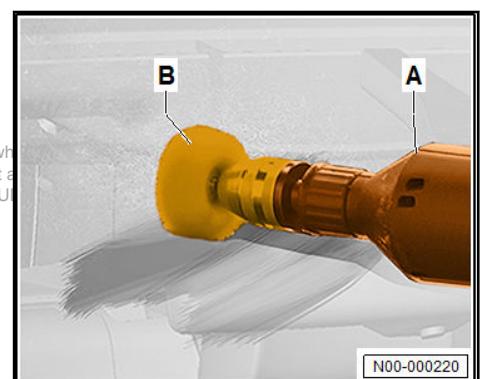
- Reapply a drop of resin.
- Apply hardening film.
- Switch on the UV lamp.
- Let the resin harden.
- Scrape off excess resin, using a commercially available cutting knife, vertically to the glass.

#### Continuation

- Clean the repair area using a lint-free cleaning cloth.

- Fix a felt -B- into a commercially available drill -A-.
- Apply a small amount of polish onto the felt -B-.
- Polish the repair area for a short amount of time and with light pressure.

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- Install the piston in the cylinder to the stop of the adjustment range.
- Store the injector in lightproof packaging to avoid UV radiation penetration.

- Clean the glass from the inside and outside.

**Tip**

After the glass repair, the vehicle is ready to operate again without any waiting time.



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## 12 Components with Adhesive Tape

⇒ "12.1 Components with Adhesive Tape, Requirements", page  
**67**

### 12.1 Components with Adhesive Tape, Requirements

#### Special tools and workshop equipment required

- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-
- ◆ Adhesive Strip Remover - VAS 6349-
- ◆ Digital Scale - VAS 231 007-
- ◆ Squeegee
- ◆ Cleaning Cloth

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#### Condition

- The temperature of the work station, the vehicle, and the components must be at the processing temperature.
- The processing temperature is between 20 °C and 35 °C (68 °F and 95 °F)

#### Removing components with adhesive tape

##### **NOTICE**

There is a risk of damage due to high temperatures.

- Protect adjacent components from heat.
- Heat up the component to 40 °C (104 °F) before removal using the Hot Air Blower - V.A.G 1416- .

#### Removing adhesive residue

#### Condition

- Pay attention to the flash-off time of the adhesive remover of 3 minutes.
- Remove adhesive residue on the painted side using Adhesive Strip Remover - VAS 6349-, Cleaning Cloth and Adhesive Remover, refer to ⇒ Electronic Parts Catalog (ETKA) .

#### Cleaning body-side adhesive surfaces for parts with adhesive tape

#### Condition

- Adhere to the cleaning solution flash-off time of 10 minutes before installation.
- The adhesive surfaces must be dry.
- Clean the adhesive surfaces with cleaning solution and a new lint-free Cleaning Cloth .

---

### Installation requirements for components with adhesive tape

#### Condition

- Remove the protective film on adhesive tape only immediately before installation.
- The paint structure must be complete for painted adhesive surfaces and at least be "ready for installation". Refer to ⇒ Paint General Information .

---

#### If a manual pressing force is specified for the component:

- Test the manual pressing force using a Digital Scale - VAS 231 007- .

#### Tip

Example for conversion: 70 N force equal approximately 7 kg (15.43 lbs) (15.43 lbs).

---

#### Continuation

#### Decorative foils and protective films:

- Spread the decorative foil using a Squeegee to be free of bubbles.

#### After installation:

- Remove the application tape at an 180 ° angle.

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#### Continuation for all vehicles

- Press the component/adhesive tape on firmly along the entire adhesive surface.
- Carefully check the component for a secure fit.
- Observe the minimum curing time of 1 hour at the processing temperature.
  - ◆ If applicable, note the differences in the minimum curing times in the action module of the respective part.
  - ◆ During the minimum curing time, the vehicle must be resting on a level surface and at the processing temperature.
  - ◆ Avoid mechanical work that affects the component to be bonded (static and dynamic loads) during the minimum curing time.

#### Condition

- The minimum curing time must be observed to ensure the vehicle is ready to operate after installation.



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erWin

The erWin logo features the brand name in a stylized, lowercase font with a small icon of a person carrying a briefcase integrated into the letter 'e'.

## 13 Disposal, Preparing

- ⇒ “13.1 Gas-Filled Strut, Preparing for Disposal”, page 70
- ⇒ “13.2 Covered Gas-Filled Strut, Preparing for Disposal”, page 70
- ⇒ “13.3 Rear Lid Drive Unit VX69 /Rear Lid Drive Unit 2 VX77 Preparing for Disposal”, page 71

### 13.1 Gas-Filled Strut, Preparing for Disposal

#### Condition

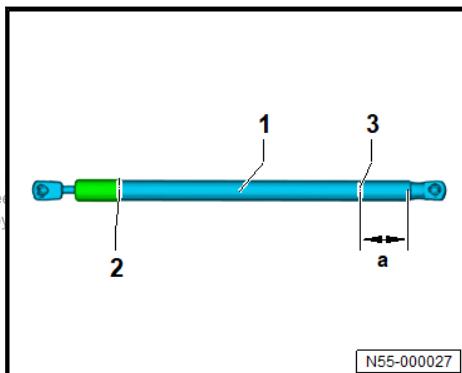
- These disposal methods may only be used on gas-filled struts which are not under pressure.

#### CAUTION

Risk of injury due to flying metal shavings.  
Irritation and injury to skin and eyes possible.  
– Wear protective eyewear.  
– Wear safety gloves.

- Saw open or drill the gas-filled strut -1- at the notch -2-.
- Saw open or drill the gas-filled strut -1- at a distance -a- to the edge of the housing -3-.
- ◆ Dimension -a- = 20 mm

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### 13.2 Covered Gas-Filled Strut, Preparing for Disposal

The covered gas-filled strut will be called suspension strut in the information that follows.

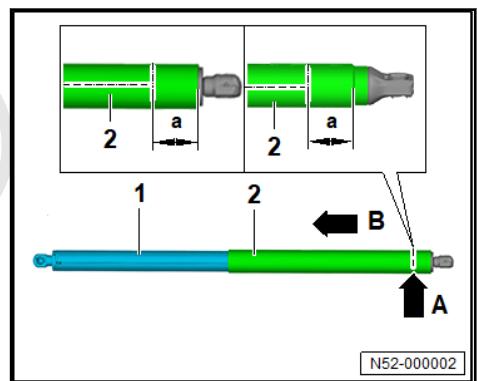
#### CAUTION

There is a risk of eye injury due to flying shavings.  
Eye irritation and injury is possible.  
– Wear protective eyewear.

#### Tip

The version of the gap/level on the suspension strut on the left and right -2- depends on the equipment/version.

- Cut open the outer protective cover all around at a distance of -dimension a- to the gap/level using a commercially available angle grinder -arrow A-.
- ◆ Dimension a 15 mm
- Remove the protective cover -2- in the -direction of the arrow B-.



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- Place a cleaning cloth underneath to catch oil leaking out.

#### CAUTION

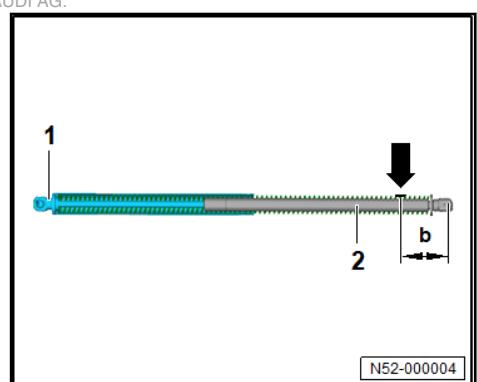
There is a risk of eye injury due to flying shavings.

Eye irritation and injury is possible.

- Wear protective eyewear.

Cover the area around the hole with a cleaning cloth.

- Saw/drill open the cylinder -2- at a distance of -dimension b- -arrow-.
- ◆ Dimension b 50 mm



- Clamp the suspension strut with the cylinder side -1- in a commercially available vise -2-.

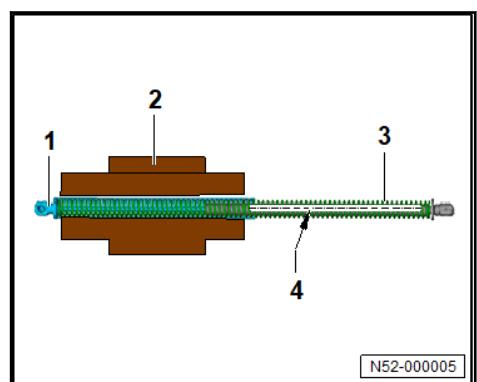
#### CAUTION

There is a risk of eye injury due to flying shavings.

Eye irritation and injury is possible.

- Wear protective eyewear.

- Separate the spring wire in the pressure spring -3- far enough lengthwise -4- using a commercially available angle grinder until the pressure spring -3- is without tension lengthwise -4-.



Condition

- If the pressure spring -3- is under tension after separating the visible spring wire, the pressure spring -3- must be separated further while cutting into the remaining plastic tube.

### 13.3 Rear Lid Drive Unit VX69 /Rear Lid Drive Unit 2 VX77 Preparing for Disposal

Special tools and workshop equipment required

- ◆ Vise
- ◆ Angle Grinder

**⚠ CAUTION**

There is a risk of eye injury due to flying shavings.

Eye irritation and injury is possible.

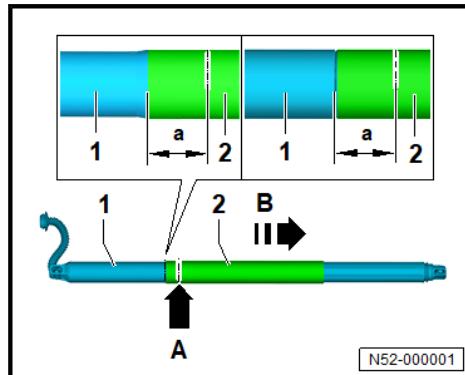
- Wear protective eyewear.

**Tip**

The version of the gap/level on the drive unit on the left and right -1- depends on the equipment/version.

- Cut open the outer protective cover -2- all around at -dimension a- to the gap/level using an Angle Grinder -arrow A-.
- ◆ -Dimension a- 15 mm
- Remove the protective cover -2- in the direction of the arrow B-II.

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- Clamp the drive unit with the engine-side -1- into a Vise -2-.

**⚠ CAUTION**

There is a risk of eye injury due to flying shavings.

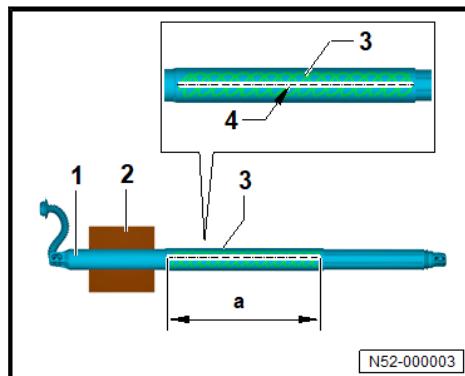
Eye irritation and injury is possible.

- Wear protective eyewear.

- Separate the spring wire in the pressure spring -3- far enough lengthwise -4- using an Angle Grinder until the pressure spring -3- is without tension lengthwise -4-.

**Condition**

- If the pressure spring -3- is under tension after separating the visible spring wire, the pressure spring -3- must be separated further while cutting into the remaining plastic tube.



## 14 Adhesives, Application

⇒ "14.1 Adhesives, General Information about Application", page 73

⇒ "14.2 Introduction to and Information about the Bonding Protocol, Including Work Samples for Bonds that require Documentation", page 74

⇒ "14.3 Minimum Curing Times for Bonded Windows", page 75

⇒ "14.4 Undamaged Window Glass, Preparing for Installation", page 75

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⇒ "14.5 New Window Glass, Preparing for Installation", page 76

⇒ "14.6 Body Flange, Preparing for Installation", page 77

⇒ "14.7 Adhesive, Cleaning if Contaminated", page 80

⇒ "14.8 Installation Instructions for Bonded Windows", page 81

⇒ "14.9 Bonding Protocol", page 83

⇒ "14.10 Two-Part Body Adhesive 180 004 M2 Preparing", page 85

⇒ "14.11 Two-Part Window Adhesive Kit", page 88

### 14.1 Adhesives, General Information about Application

#### Material Safety Data Sheets

◆ Make sure to refer to the ⇒ Safety Data Sheets .

#### Shelf Life

◆ Do not use adhesives, activators, or primers past the printed expiration date.

#### Condition

- Opened primers or activator bottles must not be reused.
- Only use containers which are not damaged.
- Do not use adhesives, primers or activators which differ in color or consistency.
- ◆ Storage temperature between 10 °C and 25 °C (50 °F and 77 °F)

#### Guidelines for working with adhesive pastes

- ◆ For information on using the cartridge gun and cartridge opener from the Volkswagen special tools catalog, refer to the ⇒ User Guide for the tools.
- ◆ The vehicle, parts, adhesive, primer and activator must be at processing temperature (acclimated).
- ◆ The processing temperature must be reached before processing adhesive surfaces.
- ◆ Do not perform welding, sanding, or polishing procedures in the immediate proximity.
- ◆ Do not use any Teflon or silicone sprays in the workshop area.

- ◆ To avoid the transfer of hand sweat and contamination to adhesive surfaces, cleaned surfaces may only be touched with clean gloves.
- ◆ Adhesives must be used within their processing time.
- ◆ Within this processing time, the adhesives must be applied and the window glass or the body part must be attached.
- ◆ Joining processes (for example rivets and bolts) in the area of the bonding must be performed in the processing time.
- ◆ Make sure that the vehicle is not used within the minimum curing time.  
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- ◆ Additional work on the vehicle may only be started after the minimum curing time has passed.

#### Applies to two-part adhesives

##### Condition

- Press on the cartridge and check if both components flow out at an equal rate. Then attach the mixing tube.
- To guarantee a complete mixture, one mixing pipe length of the freshly mixed adhesive must be pressed onto a piece of carton and then disposed.
- Opened two-part window adhesive cartridges with part number "D 004 660 M4" may not be stored for later use due to the risk of the curing process starting, but must be disposed of together with the mixing tube once the processing time has elapsed.
- Opened two-part plastic adhesive cartridges with part number "D 180 KU2 A1" may not be stored for later use for longer than 14 days due to the risk of the curing process starting, and must be disposed of together with the mixing tube once the processing time has elapsed.

## 14.2 Introduction to and Information about the Bonding Protocol, Including Work Samples for Bonds that require Documentation

##### Introduction

For special bonds, constructional means have new requirements for the bonding or adhesion process. Internal as well as external changes by the manufacturer made to these new requirements is dependent to the current status of technology according to ISO 21368, that the bonding

- ◆ Takes a higher importance in automobile manufacturing and
- ◆ A 'special process', for which the connection quality cannot be determined without destroying the bond.

##### Changes to the repair manual

If constructional means require it, then the vehicle-specific repair manual of the next vehicle- models will also contain:

- ◆ Creating and performing of the work sample
- ◆ Qualification of the personnel and
- ◆ Fill out the bonding report.

The adhesive report must completely document the bonding, materials and work sample according to the respective repair description. This is done as proof of the reliable bonding process.

The bonding protocol has been coordinated across the VW Passenger Vehicles, Volkswagen Commercial Vehicles, Audi, Skoda and Seat brands and will be introduced with the next vehicle- models.

### Qualification

For qualification acquirement the personnel will be provided with a training module which has been agreed upon in the Volkswagen Group, regarding „Volkswagen Group Bonding Expert“ via the brand specific “Knowledge Tank”. This training module includes a theoretical and practical final exam for certification. The successful participation of this training is recommended for performing safety-related bonding.

## 14.3 Minimum Curing Times for Bonded Windows

Special requirements must be adhered to when replacing bonded window glass.

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The minimum curing time is the time from bonding up to vehicle use.

The vehicle is operationally ready only after the minimum curing time has elapsed.

Check the instructions from the manufacturer on the product label for the minimum curing time.

During the minimum curing time, the vehicle must be on a level surface.

The minimum curing time for the two-part window adhesive is two hours at room temperature between 18 °C and 35 °C (64.4 °F and 95 °F).

The minimum curing time for one-part window adhesive is six hours at room temperature between 20 °C and 30 °C (68 °F and 86 °F) and a relative humidity between 30% and 80%.

## 14.4 Undamaged Window Glass, Preparing for Installation

### Special tools and workshop equipment required

- ◆ Contour Blade Set - VAS 852 005-
- ◆ Scraper Set - VAS 861 005-

### Tip

The glass can be installed without centering pins.

### NOTICE

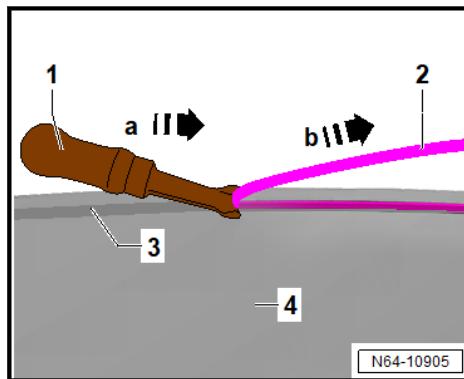
Risk of damaging the primer and ceramic coating when cutting back the window adhesive

- Only cut the window adhesive as far back as described.
- Do not treat the cut-back adhesive bead with activator, primer or cleaning solution.
- Keep the adhesive surface free of dirt and grease.

- When reusing a damaged window glass -4- cut back the remaining window adhesive -2- shortly before reinstalling with a suitable scraper -1- from the Contour Blade Set - VAS 852 005- or Scraper Set - VAS 861 005- to 1 or 2 mm.

**Tip**

When reusing damaged window glass the residual material acts as a base for the new window adhesive.



If the bonding is going to be performed longer than two hours after cutting back the adhesive bead, activate the adhesive bead:

- Shake the activator, so that all components are mixed in the correct ratio.

**Condition**

- The activator processing temperature is between 15 °C (59 °F) and 25 °C (77 °F).

 **NOTICE**

**Risk of damaging the paint with the activator**

- Apply activator precisely on the cut back adhesive bead and do not drip.
- Apply the activator with the applicator evenly and in a single stroke on the cut back adhesive bead.

**Condition**

- Adhere to the drying time of 10 minutes.
- Bonding must happen within 2 hours of activation.

## 14.5 New Window Glass, Preparing for Installation

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**Tip**

The application area for the adhesive bead is not pre-coated or primed.

If there is no identification of the adhesive surface on the window:

- Remove the adhesive surface from the removed window.

## Continuation

- Clean the window edge -1- and the highlighted/marked adhesive surface all around using a cleaning solution and a lint-free cleaning cloth.

### Condition

- Adhere to the flash-off time of 10 minutes.
- The adhesive surface must be dry.

### Condition

- The primer processing temperature is between 15 °C (59 °F) and 25 °C (77 °F).
- Shake the primer -3- for at least two minutes so that all components are mixed in the correct ratio.
- Apply a continuous thin film of primer -3- to the adhesive surface evenly and in one stroke using the applicator -2-.

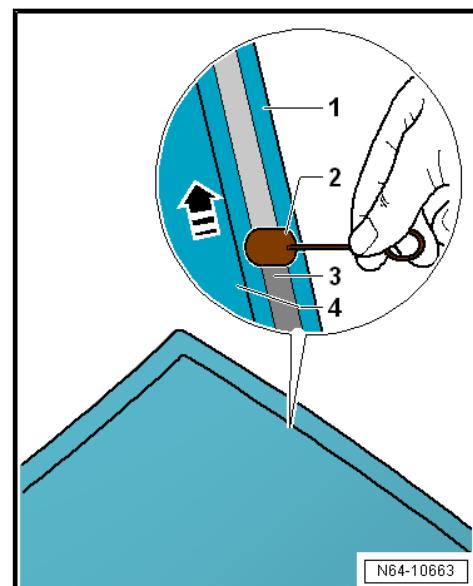
### Condition

- **A closed surface of the primer must be visible.**

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The drying time of the respective primer must be adhered to:

- Primer D 181 220 A1: drying time of 30 minutes
- Primer D 009 200 02: drying time of 15 minutes



## If the drying time of the activator was exceeded by more than 8 hours:

Primer may be reapplied only once within 96 hours after the primer application.

### Condition

- Primed adhesive surfaces must be protected from exterior influences and dirt within this time frame.
- Comply with the primer processing temperature and shake the primer bottle before opening.
- Apply a continuous film of primer, using the applicator in a single stroke.

## 14.6 Body Flange, Preparing for Installation

### Special tools and workshop equipment required

- ◆ Scraper Set - VAS 861 005-

**! NOTICE**

Risk of damaging the primer coating and the paint when cutting back the window adhesive

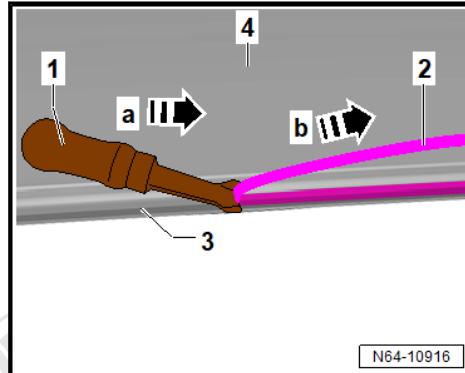
- Only cut the window adhesive as far back as described.
- Do not treat the cut-back adhesive bead with activator, primer or cleaning solution.
- Keep the adhesive surface free of dirt and grease.

Condition

- Do not remove the residual material
- Cut back the residual material -2- on the body flange -3- using a scraper -1- out of the Scraper Set - VAS 861 005 shortly before reinstalling to 1 or 2 mm.

Tip

The remaining material is the base for the new window adhesive being applied.



If the bonding is going to be performed more than two hours after cutting back, then the adhesive bead residual material must be activated with the activator.

- Shake the activator, so that all components are mixed in the correct ratio.

Condition

- The activator processing temperature is between 15 °C and 25 °C (59 °F and 77 °F)

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**! NOTICE**

Risk of damaging the paint with the activator

- Apply activator precisely on the cut back adhesive bead and do not drip.
- Apply a continuous thin film of activator with the applicator evenly and in a single stroke on the cut back adhesive bead.

Condition

- Adhere to the drying time of 10 minutes
- Bonding must happen within 2 hours of activation.

## Continuation

### Vehicles with body flange made of steel paneling:

If the body flange is worked on or partially replaced, clean and prime the area after painting.

- Clean the body flange all around with cleaning solution and a lint-free cleaning cloth.

### Condition

- Adhere to the flash-off time of 10 minutes
- Make sure to comply with the primer processing temperature and to shake the primer bottle before opening. Refer to ⇒ Rep. Gr. 52 ; New Window Glass, Preparing for Installation .
- Apply a continuous film of primer on the paint, using the applicator in a single stroke.

### Condition

- A closed surface of the primer must be visible
- Comply with the drying time of the primer. Refer to ⇒ Rep. Gr. 52 ; New Window Glass, Preparing for Installation

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## Continuation for all vehicles

If the drying time of the activator was exceeded by more than 8 hours:

Primer may be reapplied only once within 96 hours after the first primer application.

### Condition

- Primed adhesive surfaces must be protected from exterior influences and dirt within this time frame.
- Make sure to comply with the primer processing temperature and to shake the primer bottle before opening. Refer to ⇒ Rep. Gr. 52 ; New Window Glass, Preparing for Installation .
- Apply a continuous film of primer on the paint, using the applicator in a single stroke.

## Continuation

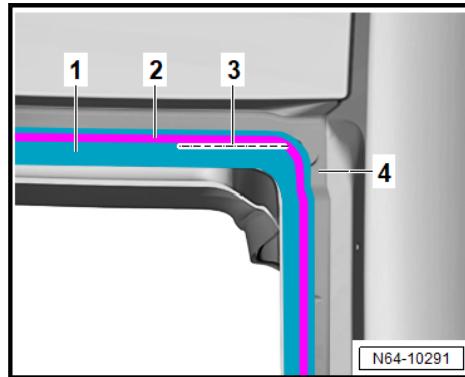
### Vehicles with body flange made of steel paneling:

If the body flange laser weld seam is not covered by an existing adhesive bead:

- Clean the body flange laser weld seam using cleaning solution and lint-free cleaning cloth.

Condition

- Adhere to the flash-off time of 10 minutes
- Make sure to comply with the primer processing temperature and to shake the primer bottle before opening. Refer to ⇒ Rep. Gr. 52 ; New Window Glass, Preparing for Installation .
- Apply a continuous film of primer, using the applicator in a single stroke.



Condition

- A closed surface of the primer must be visible
- Comply with the drying time of the primer. Refer to ⇒ Rep. Gr. 52 ; New Window Glass, Preparing for Installation .

#### NOTICE

##### Risk of leaks and corrosion due to improper sealing

- Seal off bare laser weld seams with window adhesive before bonding the glass.
- Coat the laser weld seam -3- with primer -1-.

Condition

- The information for adhesives must be observed. Refer to ⇒ Rep. Gr. 52 ; Adhesives, Application .
- Seal off the laser weld seam -3- with two-part window adhesive.

## Continuation for all vehicles

### Paint Damage, Repairing

- If there is paint damage, repair the paint structure according to the paint repair manual instructions. Refer to ⇒ Paint Structure .

## 14.7 Adhesive, Cleaning if Contaminated

#### NOTICE

##### The window glass can loosen due to cleaning the vehicle interior.

- Do not press the installed window glass outward when cleaning the vehicle interior.  
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- Clean the painted surface with a lint-free cleaning cloth.
- Clean any residual adhesive with cleaning solution.

- Clean the plastic trim panel: let the window adhesive harden for approximately one hour and remove.

## 14.8 Installation Instructions for Bonded Windows

⇒ "14.8.1 Bonded Windows and Glass Panels, Installation Instructions", page 81

⇒ "14.8.2 Bonded Window Glass, Materials", page 82

### 14.8.1 Bonded Windows and Glass Panels, Installation Instructions

Special tools and workshop equipment required

- ◆ Cartridge Piercer - VAS 221 005-
- ◆ Double Suction Lifter - V.A.G 1344-

#### Condition

- Workplace, primer, activators, adhesives, vehicles and components must have adjusted to room temperature. Refer to ⇒ Rep. Gr. 52 ; Minimum Curing Times for Bonded Windows.  
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- Note the general information in ⇒ Rep. Gr. 52 ; General Information for Application of Adhesives .
- Make sure to meet the processing temperature of one-part window adhesive of 18 °C to 35 °C (64.4 °F to 95 °F).
- Make sure to meet the processing temperature of two-part window adhesive of 18 °C to 28 °C (64.4 °F to 82.4 °F).
- Use the Cartridge Piercer - VAS 221 005- to open the cartridge.

#### NOTICE

Subsequent damage due to quick hardening window adhesive

This can lead to leaks and reduced body stiffness.

- Insert the window glass within the processing time of 10 minutes after applying the window adhesive.

#### Tip

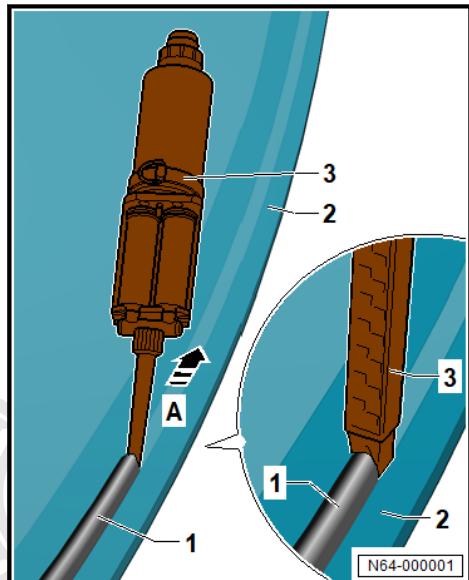
The illustration shows the two-part window adhesive. The procedure is the same for one-part window adhesive.

- Apply the window adhesive -1- all around at a right angle to the glass -2-.

#### Tip

Do not apply the adhesive bead too thickly and do not press the glass too firmly onto the body flange. Because the glass has no sealing lips, excess adhesive might be visible in the gap area.

- Using two Double Suction Lifters - V.A.G 1344- , insert the glass into the window opening, center it and press it in up to the spacer.
- Secure the glass during the minimum curing time using commercially available adhesive tape. Refer to ⇒ General Information - Body; Rep. Gr. 52 ; Adhesive Usage; Minimum Curing Times for Bonded Windows .
- When replacing components, any identification plates on the used parts that indicate a replacement part number in the ⇒ Electronic Parts Catalog (ETKA) must be transferred to the new part to meet homologation regulations.
- Replace any identification, warning and information labels on vehicle components that are unreadable or damaged, and re-attach them in the same location. For the allocation, refer to the ⇒ Electronic Parts Catalog (ETKA) .



## 14.8.2 Bonded Window Glass, Materials

The part numbers of the materials must be taken from the associated page in the ⇒ Electronic Parts Catalog (ETKA).

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- ◆ One-part window adhesive 1) 2) 3)
- ◆ Two-part window adhesive 1) 2) 3)
- ◆ Activator 1) 2)
- ◆ Primer 1) 2) 4)
- ◆ Cleaning Solution 1) 5)
- ◆ Applicator 1) 2)
- ◆ Cutting Tool for Bonded Windows - Wire - VAS 6452/2-
- ◆ Window Removal Set - Cutting Cord - VAS 861 001/1A-

- 1) Follow the manufacturer instructions provided on the label.
- 2) Only use new materials that have not passed their expiration date.
- 3) Pay attention to ⇒ General Information - Body; Rep. Gr. 52 ; Adhesive Usage; Minimum Curing Times for Bonded Windows .
- 4) Pay attention to the drying time.
- 5) Pay attention to the flash-off time.
- 6) The wire for the separating tool and the cutting cord are alternatives and meant to be used only once.

## 14.9 Bonding Protocol

### Introduction

Depending on the component, there are different requirements for the joining and bonding process. This includes, for example, the creation of an adhesive report.

Bonding protocol is done as verification of the reliable bonding process.

### Condition

- An adhesive report must be created if required in the respective repair description.
- The adhesive report must completely document the bonding, materials and work sample according to the respective repair description.

### Work Sample

#### Condition

- Used to ensure and verify correct bonding.
- The result of this work sample must be documented in the bonding protocol.
- To create a work sample, apply an approximately 10 cm long adhesive bead on a firm subsurface and evaluate the minimum curing time.
- For the evaluation, cut the work sample at several points using a knife and evaluate the hardening based on the cut surface.

Checks for work sample made with one-part adhesive bead:

- ◆ The adhesive may not pull into any threads when contacted and it must have a firm skin.
- ◆ Inside the adhesive bead, there may be no liquid components after the minimum curing time.

Checks for work sample made with two-part adhesive bead:

- ◆ The adhesive must be completely hardened.
- ◆ Inside the adhesive bead, there may be no liquid components.

With a negative result of the work sample (no complete hardening), no reliable bonding can be ensured. If this is the case, it is necessary to take measures for hardening and, if necessary, repeat the bonding.

Bonding Protocol	
To document bonds that require documentation	
Date of bonding:	Request number:
Qualified workshop:	
Name of processor:	
Current repair manual used:	Yes

Bonding Protocol						
Cli-mate	Pro-cess-ing/ com-po-nent tem-perature	Spec-ified:			Ac-tual:	
	Hu-midi-ty (for one-part ad-hesives)	Spec-ified:			Ac-tual:	
Pre-treat-ment	Cleaning solution (part num-ber, name):					
	Flas-h-off time:	Min-i-mum time:		Ac-tual time:		
Pri-mer (if nec-es-sary)	Prod-uct (part num-ber):		Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.			
	Batch num-ber:					
	Expi-ra-tion date:					
	Flas-h-off time s:		Min-i-mum time:		Ac-tual time:	
Acti-vator (if nec-es-sary)	Prod-uct (part num-ber):					
	Batch num-ber:					
	Expi-ra-tion date:					
	Flas-h-off time s:		Min-i-mum time:		Ac-tual time:	
Sur-face	Sur-face 1					

Bonding Protocol						
	Sur- face 2					
	Examples: cleaned new part surface, primed, adhesive bead that has been cut back, partially or fully repainted:					
Adhe- sive	Adhesive (part num- ber, name) (Note: use of several cartridges possible)					
Expi- ra- tion date:	◆ ◆ ◆ ◆					
Batch num- ber(s):	◆ ◆ ◆					
Cur- ing Time :	Maximum permitted time:			Ac- tu- al time:		
Work sam- ple:	Is a work sample necessary according to the re- pair man- ual?		Yes	–	No	–
	Sam- ple label					
	Is the sam- ple OK?		Yes	–	No	–
	Note: If the inspection result is "No", the bonding must be replaced as specified					
Deviations/comments:			Measures:			
Signature of the executing person:						

## 14.10 Two-Part Body Adhesive 180 004 M2

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### Adhesive Surfaces, Preparing

- ◆ Sand down the adhesive surface to bare using sanding material based on silicon carbide (SIC)
- ◆ The adhesive surfaces must be free of oils, adhesive residue, humidity, paint and oxide coatings

- ◆ Body structural adhesive must only be used on bare metal components
- ◆ Clean the bare metal adhesive flange areas with a lint-free cloth, soaked with isopropyl alcohol or acetone
- ◆ The vehicle, parts and adhesive materials must be at processing temperature (acclimated). The processing temperature must be kept for 30 min before work on the adhesive surfaces starts

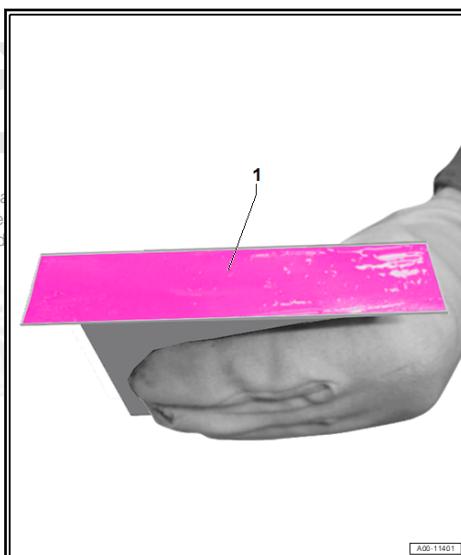
Processing time in min	Temperature in °C
80	15
75	18
65	20
60	23
50	25
40	30
30	35

### Joining Process

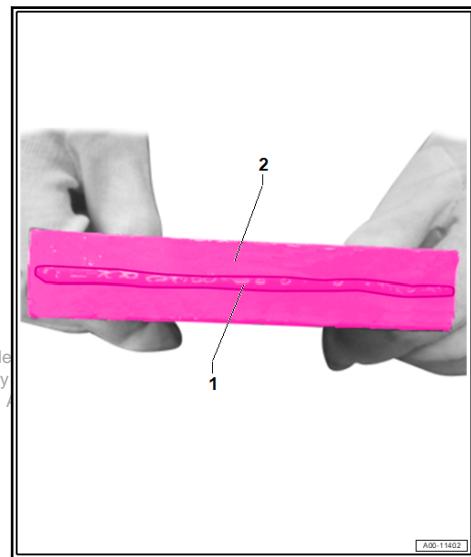
- ◆ Press out the adhesive without mixing tube, until both components exit the cartridge
- ◆ Attach the mixing tube to the cartridge and check the exiting adhesive
- ◆ Before application to the joining area, apply a 10 to 20 cm bead on a paper towel or similar and throw away later on. The hardening process can also be checked with this bead.
- ◆ In addition, apply an approximately 10 cm long sample adhesive bead on a paper towel or similar. Refer to ⇒ Rep. Gr. 52 ; Bonding Protocol .

- Spread the adhesive on both joining area flanges and spread them flat using clean tools. Application height 0.5 mm

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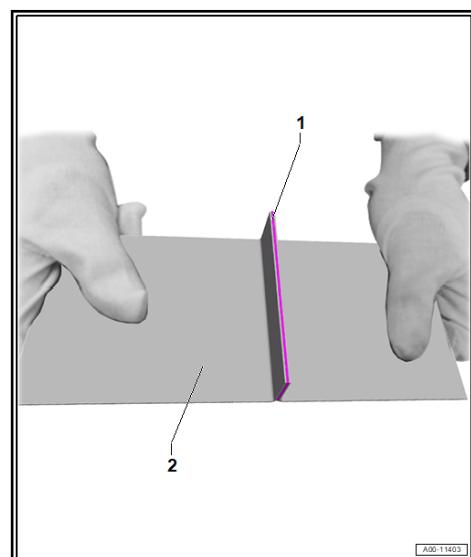


- Apply an additional adhesive bead to the center of the joining area.



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- Adhere within the processing time, in order to ensure a high-quality and secure bonding.
- Remove excess material with a clean towel.



## Hardening

- ◆ The body structural adhesive used hardens at temperatures between 18 °C and 80 °C (64.4 °F and 176 °F).
- ◆ The hardening is accelerated by hardening.
- ◆ Only use devices with a temperature setting, automatic distance measuring and visualization of the measuring point.
- ◆ Do not stress bonded parts until assembling stability is reached.

## Assembling Stability

- ◆ Moving and further processing at the vehicle after repair bonding is only allowed after a minimum curing time of 12 h at 23 °C (73.4 °F).
- ◆ The waiting period can be reduced by applying heat, for example curing time of 60 min at 60 °C (140 °F).
- ◆ The time frame from connecting the repaired parts until operation must be a minimum of 96 h at 18 °C (64.4 °F).

## Corrosion Protection

Carefully prime the accessible adhesion areas after hardening and seal them with body sealant.

Protect adhesion areas in cavities against corrosion using cavity sealant.

## 14.11 Two-Part Window Adhesive Kit

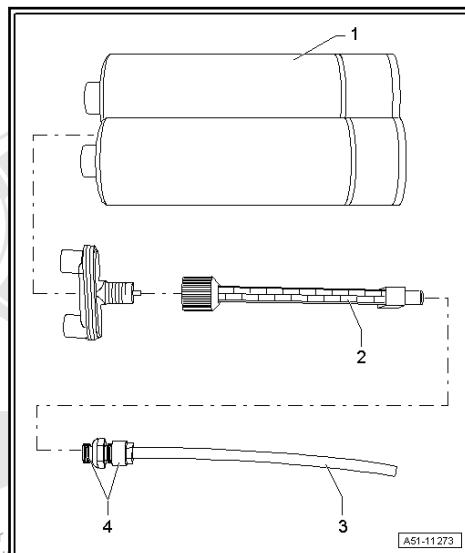
Use the two-part window adhesive Set D 004 660 M3 -1- to install the window adhesive with the connecting hose 000 809 937 -3- and adapter -4-.

1 - Two-Part Window Adhesive Kit D 004 660 M2

2 - Static Mixer

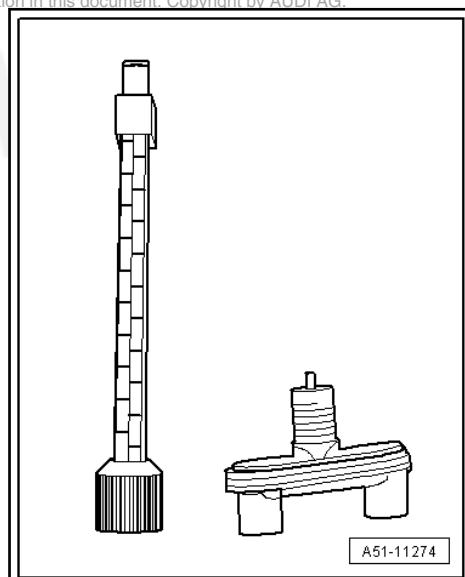
3 - Extension Hose 000 809 937

4 - Adapter for Connecting with Static Mixer

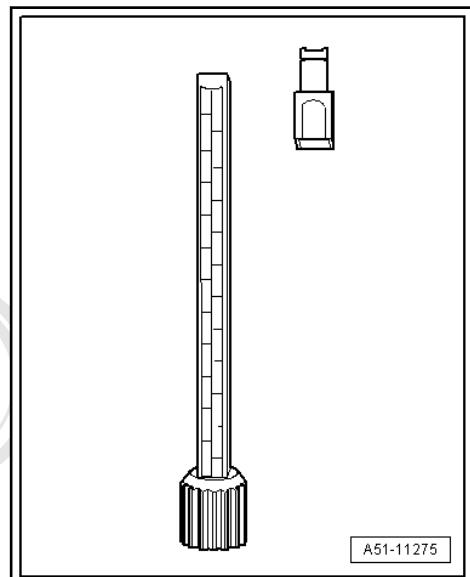


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Remove the static mixer from the two-part window adhesive kit.

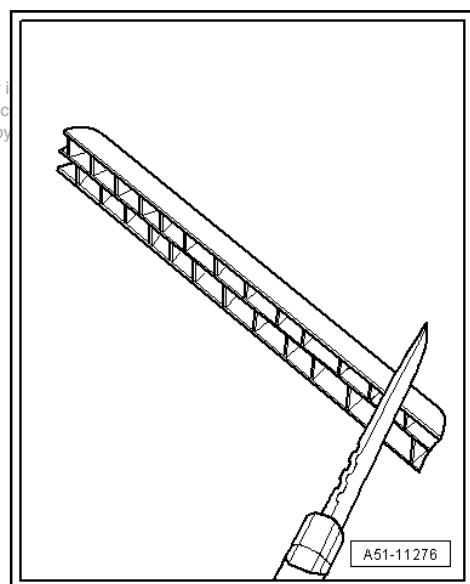


Remove the front cap of the static mixer.

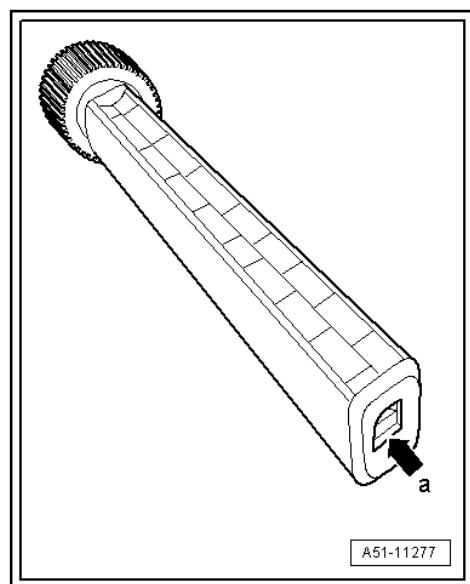


Remove the inner part of the mixer from the static mixer.

Shorten the inner part of the mixer so that the connecting hose can be installed completely.

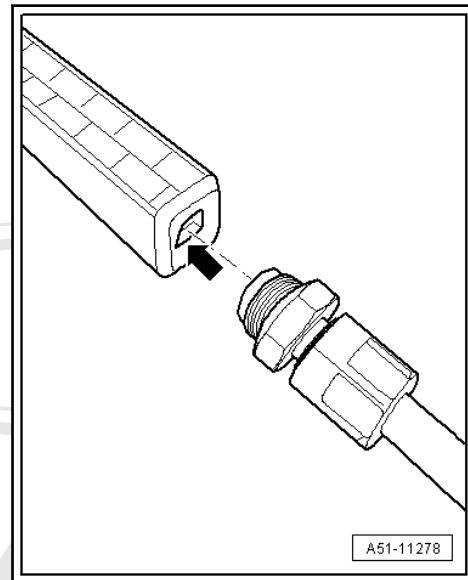


Drill the opening of the static mixer -a- with drill 9 mm diameter.



Push in the inner part of the mixer in the static mixer.

Bolt the connecting hose with the adapter on the static mixer.



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# Cautions & Warnings

**Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.**

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Audi retailer or other qualified shop. We especially urge you to consult an authorized Audi retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Audi.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Audi is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Audi retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the Audi Factory Approved Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted without the express written permission of the publisher. © Audi of America, Inc. 2018 Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.

## Cautions & Warnings

- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.
- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly, do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Audi specifications. Makeshift tools, parts and procedures will not make good repairs.  
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- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.

## Cautions & Warnings

- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Audi Service technicians should test, disassemble or service the airbag system.
- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Audi Service technicians using the Audi Factory Approved Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

**I have read and I understand these Cautions and Warnings.**

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